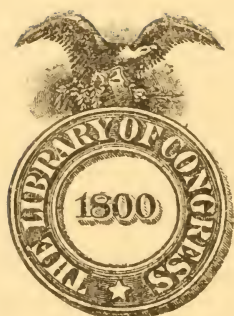


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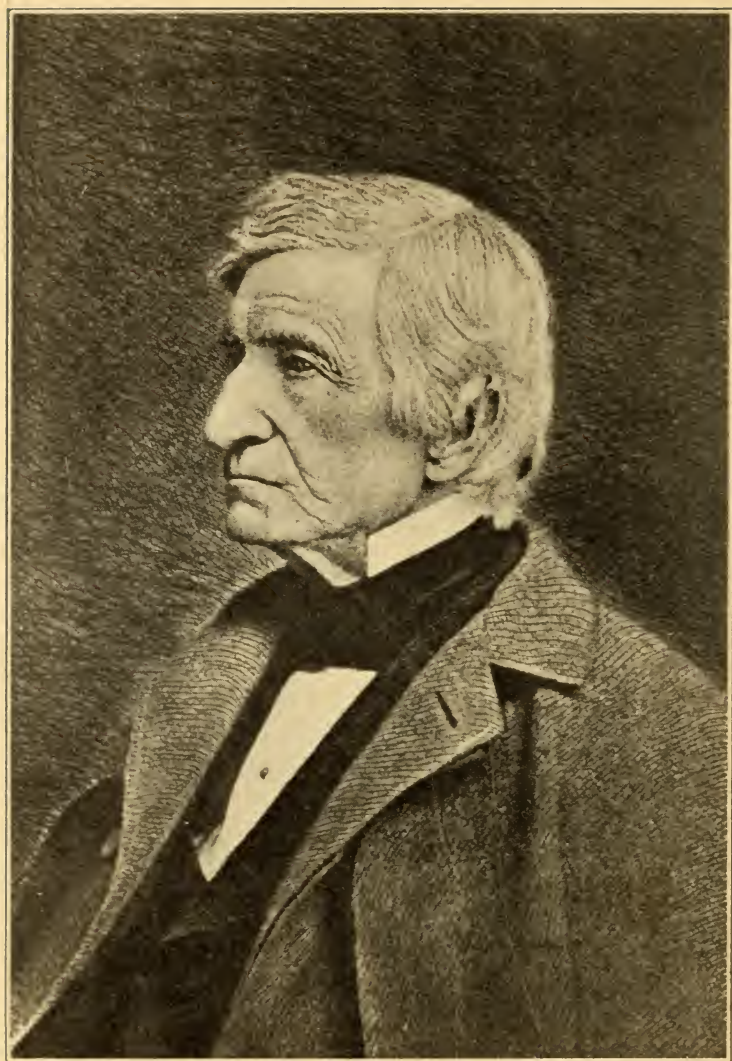


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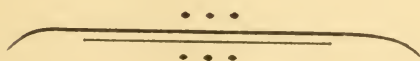
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William B Rogers

Concerning
The Massachusetts
Institute of Technology



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FOREWORD

BROADLY speaking, the purpose of the school of applied science is to give its students such a training as will enable them to attain the highest success in their professional careers, and at the same time to educate them so liberally that they may be well fitted for the private and social responsibilities that lie before them. With this end in view, our *Alma Mater* aims to combine a technological with a cultural education; her ideal is to produce professional leaders who at the same time shall be broad-minded men.

The world at large, unfortunately, knows but little of Undergraduate Technology, of the opportunities—educational and social—which the Institute has to offer; and the need of a book which should be, in the best sense, descriptive of the School has long been felt by both alumni and undergraduates. The present publication contains information which it is hoped will be equally of interest to prospective students and to those who have just entered the Institute.

IF this little volume fulfils its purpose of making better known the real Technology, it will be largely due to the suggestions and help received from the Faculty and Instructing Staff, to the generosity of numerous Alumni, and to the hearty co-operation of many others interested in the welfare of the School.

As students of M. I. T., we desire to express our appreciation of the kind assistance which has made possible the completion of this undertaking, and especially to extend our thanks to Arthur A. Noyes, former acting president; to Alfred E. Burton, dean; to Henry G. Pearson, associate professor of English; and to Isaac W. Litchfield of the alumni association.

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‘‘THE INSTITUTE’’

HISTORICAL SKETCH

THE history of the Massachusetts Institute of Technology is intimately bound up with the lives of two great men, William Barton Rogers and Francis Amasa Walker; for it was these far-seeing leaders who, with the cordial coöperation of an enthusiastic and devoted Faculty, gave to the Institute not only a unique educational system, but also a policy which demanded of its students a severe standard of achievement and high ideals of service.

Rogers, as an old pupil of his has said, was a great man because he was a great teacher. Professor of Natural Philosophy and Geology at the University of Virginia, State Geologist of Virginia, and holding a brilliant and commanding position as a popular lecturer in a time when the lecture was one of the greatest forces in the community, he was in a position to see clearly the unrealized possibilities of scientific education. As early as 1846 Professor Rogers in a letter to his brother unfolded plans then germinating in his mind for a Polytechnic Institution.

In 1853 he resigned his professorship and moved to Boston, of which city he had written some years before, ‘‘I have felt persuaded that of all places in the world it was the one most certain to derive the highest benefits from a Polytechnic Institution. The occupations and interests of the great mass of the people are immediately

connected with the applications of physical science, and their quick intelligence has already impressed them with just ideas of the value of scientific teaching in their daily pursuits."

A few years later, when the newly filled lands of the Back Bay were to be sold by the state, and when Governor Banks suggested that the proceeds might well be devoted to "such public educational improvements as will keep the name of the Commonwealth forever green," Rogers saw his opportunity. In 1860 he prepared a memorial asking that the land between Boylston, Newbury, Berkeley, and Clarendon streets be set apart for scientific and technical museums and for a polytechnic college. In 1860 the volunteer committee in charge of this movement adopted a definite plan for "an Institute of Technology, including a Society of Arts, a Museum of Arts, and a School of Industrial Science." A strong group of public-spirited citizens gathered to the support of this program. In the fall of 1860 articles of incorporation were drawn up, and on April 10, 1861, Governor John A. Andrew signed the bill establishing the Massachusetts Institute of Technology and granting to it the land specified in the memorial. In 1863 the legislature allotted to the Institute one-third of the sum granted to the state by the national government, thus making it the College of Mechanic Arts of the Commonwealth under the general terms of the Land Grant Act, which assigned to educational purposes the proceeds of the sale of western lands.

The institution thus established was a pioneer in many respects; but so wisely were its foundations laid that, in the present flux of doubt and questioning as to the general tendencies of higher education, the Institute policies still stand firm. Both the aims and the methods of the Insti-

tute were novel ones. The traditional education was classical and academic. The Institute insisted upon the study of physical science, not merely because of its practical significance, but also as an essential part of any system of general education. Its students were not merely to be equipped for the performance of the technical part of the activities of the business world. It was no specialized industrial training that Rogers planned. "The true and only practicable object of a Polytechnic School is, as I conceive," he said, "the teaching, not of the manipulations and minute details of the arts, which can be done only in the workshop, but the inculcation of all the scientific principles which form the basis and explanation of them, along with a full and methodical review of all their leading processes and operations in connection with physical laws." Whether a student at the Institute studies civil, mechanical, or electrical engineering, architecture, chemistry, or biology, is a matter of individual preference. In whichever department he works he gains the scientific point of view, the mastery of fundamental principles, the power of hard work, the faculty of adapting means to ends, that form the groundwork of a successful career in any line of applied science whatsoever. Furthermore, it was an essential part of the original plan of the Institute to combine with a scientific training a general acquaintance with humanistic studies, such as literature, history, language, economics, and government, so that its students might receive a broad and liberal culture. As to educational methods the policy of the Institute was almost equally revolutionary. The system of laboratory instruction was given here a unique prominence, and from it resulted the insistence on personal contact between student and instructor which is especially characteristic of Institute methods.

The School of Industrial Science of the Institute opened on February 20, 1865, with a class of only fifteen students, but a rapid increase in numbers took place in the next few years. President Rogers guided the destinies of the growing school until 1870, when illness compelled his resignation, and John D. Runkle, Professor of Mathematics in the Institute, took his place, serving as president till 1878. The decade from 1870 to 1880 was the most critical one in the history of the Institute, largely owing to the serious financial depression prevailing throughout the country, and but for the almost heroic devotion of the Faculty and the courage and generosity of a few stalwart friends, the Institute must have closed its doors. In spite of failing health, President Rogers again undertook the duties of the presidency in 1878. He carried the school through this critical period, and in 1880 selected Francis A. Walker as the man best fitted to carry on his work. Death came to the founder of the Institute upon the platform of Huntington Hall while he was addressing the graduating class of '82. In the words of his successor, "All his life he had borne himself faithfully and heroically, and he died, as so good a knight would surely have wished, in harness, at his post, and in the very part and act of public duty."

Francis Amasa Walker was inaugurated as president in 1881. He had graduated at Amherst in 1860 and in the next year had enlisted in the 15th Massachusetts Volunteers. He served with distinction in the Peninsular campaign and at Fredericksburg and was seriously wounded at Chancellorsville. For "gallant and meritorious services" in this battle he received the brevets of colonel and brigadier-general. During the advance upon Richmond in 1864 he was taken prisoner, and after six weeks in Libby Prison was released upon parole. After

At the close of the war he made a brilliant record as Director of the Ninth and Tenth censuses. In 1873 he became Professor of Political Economy in the Sheffield Scientific School at Yale, from which position he was called to the presidency of the Institute.

During Walker's administration the Institute grew "from a struggling technical school to a great scientific university." In 1881 there was only one important building; the instructing staff numbered 37 and the student body 302. In 1897, when General Walker died, like Rogers, at his post, the Walker Building, the two Engineering buildings, and the Garrison Street shops had been added to the material plant; there were 130 members of the instructing staff and 1200 students. Of far more consequence, however, than mere growth in numbers was Walker's influence upon the intellectual and moral tone of the school. "Soldier, economist, statistician," he was in hearty sympathy with everything that made for broad and liberal culture. The departments of literature and political economy were developed, and the strength and breadth of training which Rogers' prevision had planned was brought to fruition under his successor. Greatest of all, however, was Walker's personal influence. His courage, energy, and enthusiasm, and aggressive endorsement of the Institute's plan of education were the main elements in its successful development. The spirit of Technology to-day is in large measure the reflection of the spirit of President Walker.

On Walker's death in 1897, Professor James M. Crafts acted as president for a short period, and upon his resignation in 1900 Dr. Henry S. Pritchett was called to the presidency from the directorship of the Coast and Geodetic Survey. The most notable work of his administration was perhaps the development of social activities and the

betterment of the physical condition of student life. In 1901 a fund of \$100,000 was subscribed by Alumni to be used for a gymnasium and clubhouse as a memorial to President Walker, which will be erected as soon as the future site of the Institute is secured. In 1902 the Technology Field in Brookline was laid out for track and field athletics. Pending the completion of the Walker Memorial, the Technology Union was established. The growth of the last five years has placed the Institute in the forefront of American colleges as an exponent of a sane and well-developed student life.

In 1904 and 1905 a definite plan for a closer affiliation and an organic connection between the Institute of Technology and Harvard University was carefully considered. After full discussion of its merits, strong disapproval of the plan was expressed by the Faculty and Alumni. The plan was finally abandoned in 1905. The discontinuance of the Lawrence Scientific School and the establishment of the Graduate School of Applied Science at Harvard have since removed all competition between the institutions; and each is to be independently developed along its own characteristic lines.

On Dr. Pritchett's resignation in 1907, his place was filled temporarily by Dr. Arthur A. Noyes, '86, who gave up congenial work as Director of the Laboratory of Physical Chemistry at the Institute, in which he had gained an international repute, for the trying and unfamiliar labor of administrative duties. The Institute needed him; and the response was complete and satisfying. The two years of his administration were marked by notable progress along educational lines. The conference system was instituted, by which students of the lower classes are brought into direct contact with their instructors for personal help and guidance. Physical train-

ing was introduced as a requirement for all first-year students. Five-year courses leading to the Bachelor's degree in two departments of study, by which the student is enabled to get a broader training or one in two related professional lines, were greatly developed. Advanced courses of study for graduate students were provided in almost all of the departments. A research laboratory of Applied Chemistry was added to the existing research departments of Physical Chemistry and Sanitary Science; and in 1907 the degree of Doctor of Philosophy was first conferred by the Institute. In 1908 a new building was erected in order to provide more suitable quarters for the Technology Union and a common dining-room for students.

On November 11, 1908, Professor Richard C. Maclaurin, of the Department of Physics at Columbia University, was elected, and on June 7, 1909, he was inaugurated as President of the Institute. As a distinguished scholar in two distinct branches of learning, mathematical physics and law, and a man of wide experience in the educational systems of three continents, his coming marks the beginning of a new epoch in the history of the Institute. Its growth necessitates an extension of its material facilities, which within a few years is to be provided for by rebuilding the Institute upon a new site. Meanwhile, in carrying out the new development there will be no sacrifice of the old ideals, of the present standard of scholarship, and of breadth and thoroughness of training. Whatever outward changes the Institute may undergo, it must, in the words of President Maclaurin, retain "the old spirit, that spirit of thoroughness, breadth, high-mindedness, and loyalty that makes the brand of a Tech man."

CHARACTERISTICS OF THE INSTITUTE PLAN OF EDUCATION¹

FIRST among those characteristics is to be mentioned the fact that from the beginning to the end of the period of study a definite aim is kept before the student, and the character and sequence of his studies are largely prescribed in such a manner as will in the opinion of the Faculty best lead to the desired end. The student selects at the beginning of his second year the profession for which he desires to prepare himself; but the Faculty with its broader experience then determines in large measure the studies which are best adapted to fit him for his lifework. It is believed that the unlimited freedom of choice permitted at many colleges commonly results either in superficiality rather than in soundness of training, or in narrowness of professional knowledge, rather than in breadth of culture.

In planning its courses of study, the Institute has followed the idea that the three sides of education which are expressed by the words knowledge, mental training, and culture, must go hand in hand, each being kept steadily in view throughout the whole period of study. It lays, however, especial emphasis on the principle that the training of the mind and the formation of sound habits of thought and of work must be the main object striven for in the earlier years of that period. It holds,

¹ Extract from the address of Dr. Arthur A. Noyes at the inauguration of President Maclaurin.

in the words of one of our great American psychologists, that "the man who has daily inured himself to habits of concentrated attention, energetic exercise of will, and self-denial in unnecessary things, will stand like a tower when everything rocks around him and when his softer fellow-mortals are winnowed like chaff in the blast." On the other hand, the Institute holds that the breadth of view and liberality of judgment which constitute culture must be acquired gradually, as the student advances in maturity and experience, and this can be done more rapidly in his later than in his earlier years, and more effectively by personal contact with his teachers and fellow-students than by attendance at a variety of lecture courses on those subjects which through the traditions of education have come to be regarded as the main sources of liberal culture. Thus in these respects the system of education which the Institute typifies stands in sharp contrast with the university system, of which the principle is that the purely cultural education of the college shall precede the strictly professional training of the graduate school.

Another characteristic of the Institute is that it has developed in an unusual degree conditions of personal contact between instructor and students, through the fact that most of its instruction is given to small sections of students or to individuals in the laboratories, drawing-rooms, and class-rooms, and through the conferences recently introduced in first and second year physics.

The Institute lays, moreover, special emphasis on the study of science; for training in scientific method and acquirement of the scientific spirit are considered to be not only essentials to professional success, but fundamental elements in culture and in life. To the question what knowledge is of most worth, it answers *science*, as did

Herbert Spencer fifty years ago. And with him it holds that "for discipline as well as for guidance, for intellectual as well as for moral training, the study of science properly pursued is of chiefest value." It therefore aims to give its students such a scientific training as will make them efficient agents in promoting the advancement of science and its applications to the useful and liberal arts. *Efficiency* is the key-note of the Institute's system of education; but at the same time the significance of *culture* is not underestimated; and as an important means of securing it, the value of studies in history, politics, literature, language, and art is fully recognized and they are given a prominent position in our curriculum.

Finally, it should be mentioned that, in conformity with these ideals, there have been developed at the Institute conditions of student life from which there has resulted a more duly proportioned division of time and interest between the studies and the social and athletic activities of students than prevails at many colleges. The standard of scholarship which the Faculty demands of its students is inconsistent with an excessive devotion to outside pursuits, and with undue subordination of the intellectual to the physical and social interests. Yet, on the other hand, it should be realized that the student life of the Institute is at the present time so developed as to afford abundant opportunity for recreation and good fellowship, and for the cultivation of athletic, literary, artistic, and professional activities, as will be fully illustrated by the later chapters of this book.

THE INSTITUTE COURSES

The Choice of a Course of Study¹

LET us first consider the principles on which your choice of a course of study should be based. Let me ask you, as the first step in this consideration, to bear in mind the following words of Francis Parkman, the historian, as to what determines success: "The man who knows himself, understands his own powers and aptitudes, forms purposes in accord with them, and pursues those purposes steadily, is the man of success." In the spirit of this advice, try first of all to determine what kind of work you are most fitted for. This you can judge of in two ways,—by the results of your work in the preparatory school and at the Institute during the present year, and by your own tastes and inclinations.

Consider first in what kind of studies you are most interested and have been most successful: whether in mathematics, or mechanic arts and drawing, or artistic design, or the physical sciences like physics and chemistry, or the natural sciences like geology or biology, or literature, language, history, and political and social sciences.

Consider, too, in what general directions your interests and tastes lie: whether they are those of the engineer, who executes scientific works; or those of the mechanical inventor, who plans and constructs machines; or those of the applied scientist, who investigates and supervises industrial processes; or those of the artist, who designs works

¹ Extract from an address to the First-Year Class by the President of the Institute.

of beauty; or those of the scientific scholar and teacher, who studies, investigates, and teaches for the sake of advancing human knowledge.

Consider finally how far these different subjects of study and different aptitudes are involved in the various courses given at the Institute. To make this matter clearer, let us arrange the courses in groups and review them. First, there is the large group of engineering courses which rest almost wholly on the sciences of mathematics, mechanics, and electricity. This group consists of the Courses in Civil and Sanitary Engineering, those in Mechanical Engineering and Naval Architecture, and those in Electrical Engineering and Electrochemistry. Since the six courses in this group are based on the science of mathematics, they should not be taken by a student who does not have a distinct aptitude for this subject. Of course, a single failure this term should not lead you to conclude that you do not possess this aptitude; but if after you have had the whole year's work in mathematics, and have thus given the subject a fair test, you do not succeed in it, do not hesitate to give up the thought of taking one of these mathematical courses. Most of the men who fail in our strictly engineering courses do so for lack of mathematical aptitude, and many of them would make a success in other kinds of scientific work that are less dependent on mathematics. Perseverance is a virtue, but it becomes perversity when carried too far. Therefore do not be led by any false notions of the merit of persistence into continuing in a course in which you cannot do your best work; and especially do not be influenced by the idea that you came to the Institute to pursue a particular course, but revise that decision in the light of your added experience.

There is another group of courses in engineering or applied science which involve mathematics and mechanics, but in which these subjects form a less essential part. These are the Courses in Mining Engineering and Metallurgy and in Chemical Engineering. Since these courses involve much chemistry as well as some mathematics, they should be taken only by those who are interested and successful in chemistry and who have a fair degree of proficiency in mathematics.

Then there are the non-mathematical courses in applied science,—in Chemistry, Biology and Geology and Geodesy. These courses, just as distinctly as the engineering courses, lead to technological or scientific professions. To be successful in these courses, a man needs not mathematical ability, but the qualities of the scientist,—the desire to know for its own sake and to make discoveries, the ability to devise new processes and methods, and to make improvement in old ones. The engineer is primarily the man who directs the construction of works or machines and the installation of apparatus for the carrying on of industrial operations: he is the executor of scientific undertakings. The chemist or biologist who devotes himself to industrial work is the man who primarily devises and improves methods and processes: he is the scientific expert and originator. In any technological profession the combination of these two faculties is, of course, highly desirable: the engineer to reach the highest success must be able to originate, and the applied scientist must be able to execute; but the primary distinctions between their activities are those I have stated. For example, the chemist devises an improvement in the process of making rubber, or paper, or leather; the engineer builds the machinery, arranges for the power, and secures the materials required for its practical execution. Consider, then,

whether your interest and aptitude lie rather on the side of practical execution or on that of the study, investigation, and origination of new processes.

The Course in Architecture stands to some extent by itself. Architecture is a fine art. Its object is not merely the erection of structures for utilitarian purposes: it is rather the design of structures that are objects of beauty. The architect cannot afford to forget that "a thing of beauty is a joy forever," and that a building which is not a thing of beauty is an eyesore forever. Since in this Course much drawing and original design are required, it should be taken only by those who are good at drawing and design and who have an artistic taste.

I wish also to say a few words about the pure science courses, — those in Physics, Biology, Geology, and the physico-chemical option of that in Chemistry; for a sufficient number of students do not enter these courses. This is all the more regrettable because from these courses have come some of our most distinguished graduates, who occupy some of the highest positions in the country. Graduates from these courses become teachers in the larger high schools and academies, professors in colleges and scientific schools, scientific investigators and experts in government employ or in research laboratories, and, in the case of the Course in Biology, physicians. Those of you who are interested in your work in its strictly scientific aspects, rather than in its engineering or executive aspects, should carefully consider the desirability of preparing yourselves for teaching and research positions, especially in the higher institutions of learning; for the supply of good men for such places is inadequate. Moreover, to a man with scholarly tastes, who wishes to study and to make investigations and scientific discoveries, who enjoys the personal contact with young men, who appreciates the

opportunity he has for making them into efficient agents for the world's work, the position of instructor or professor in a college or scientific school is a very attractive one. Here again it is a question of aptitude and interests; but for the man who possesses the qualities of a successful teacher and investigator there is no higher service he can render to his country or to his fellow-men than that which results from his devoting himself to these pursuits. It has been well said that the chief industry of Massachusetts is the production of men, — and the teacher is the engineer who carries on that industry. Bear in mind also that it is to the professors in educational institutions, and not to practising engineers, that we have in the past been indebted for almost all the fundamental advances in science and technology, and that to the former special opportunities for making such discoveries are afforded.

Let me add a word about the Course in Biology, which I have alluded to as leading to the profession of Medicine. Since the practice of this profession is based on chemistry and biology, a scientific course of the kind given at the Institute forms, in the opinion of many, a far better preparation for the Medical School than the usual college course devoted to classics and to humanistic studies. Indeed, one reason why more physicians do not rise to scientific eminence is, I think, that they do not have such a thorough scientific training as is given to our engineers. Graduates in the Course in Biology are, moreover, prepared to enter at once into the important field of municipal sanitation.

Finally, let me bring to your attention another opportunity which the Institute offers — that of its five-year courses, which have been much developed during the present year. These courses are of three types. In one of these the student supplements all the required work of

one of the regular four-year courses with the equivalent of an extra year of study in language, literature, fine arts, history, economics, and in the fundamental sciences, chemistry, physics, astronomy, geology, and biology. These additional general studies are entirely elective. This plan of study thus provides in large measure for the breadth of scholarship which a college course is designed to supply; but it does this by the methods and in the atmosphere of the scientific school and with special emphasis upon general scientific studies as a part of liberal education. Upon students who complete such a course is conferred the degree of Bachelor of Science in two departments of study, namely, in General Science, and in the branch of engineering in which the professional work has been completed.

A second type of five-year course makes provision for those students who desire to secure a training in two allied branches of science or engineering, as in electrical and mechanical engineering, mechanical and chemical engineering, mining engineering and geology, etc. Such combination of knowledge and training is so often required in professional practice that the student who has received it has exceptional opportunities open to him. For the completion of such a course the degree of Bachelor of Science in two professional departments of study is awarded.

In a third type of five-year course, provision is made for distributing the work of the last three years of the regular four-year courses over four years without additional requirements, thus reducing the number of subjects required in any term. This arrangement affords the opportunity for more thorough work in each subject by enabling a student to devote more time to outside study and to practice in the laboratories, drawing-rooms, and in the field; and it enables regular standing to be maintained by the slow, thoughtful student, who, though able to

understand and perform our work satisfactorily, finds it difficult to do it properly at the rate and under the pressure which our four-year schedules involve. This form of five-year course was started by the Faculty in recognition of the fact that "the race is not always to the swift," — that the quickest students are often not the most profound, nor the most successful in after-life, — that thoroughness, thoughtfulness, and originality are more essential qualities than the power of rapid assimilation of knowledge. Those of you, therefore, who find, either at the end of this year or during your second year, that you are able to understand the various studies and to do the problem work and the thinking involved, but cannot do it to your satisfaction at the *pace* of our four-year schedules, should change into a five-year course.

The essence of all I have said is that you should consider your own tastes and aptitudes in choosing your course. Let me again urge you not to be influenced by a preconceived idea that you have come to the Institute to take a certain course. If your experience this year shows that you are better fitted for some other course, change to it without hesitation. Another thing, — and on this I would lay much emphasis: do not be influenced by the idea that one course leads to more remunerative positions than another. For competent graduates of every course there are more good positions waiting than can be filled. Whether you succeed or not will depend simply on whether you are fitted to fill these positions satisfactorily. So, from this point of view also, it is desirable that you prepare yourself for that profession for which you are most adapted. When you have deliberately determined what your lifework is to be, you must pursue it with energy and determination — when you have come

fully to "understand your own powers and aptitudes," you must "form purposes in accord with them, and pursue those purposes steadily"; but the decision must not be formed hastily.

Civil Engineering

(Course I)

ONE hundred years ago there were two recognized branches of engineering, — civil and military, the former comprising all engineering work except that for military purposes. In those days the civil engineer could cover the whole field. The scientific and mechanical discoveries of the last century, however, have led to the differentiation of new branches of the profession, mechanical engineering, mining engineering, and electrical engineering having become separate vocations. Civil engineering, however, still remains a very broad field, covering the construction of railroads, street railways, canals, the improvement of rivers and harbors, the development of water power, the construction of irrigation works, of bridges and buildings, and of stationary structures of all kinds.

Broadly speaking, civil engineering may now be divided into structural engineering, railroad engineering, sanitary engineering, hydraulic engineering, and topographical engineering, and each of these separate departments is so extensive that the practitioner must choose one of them as his specialty. Thus the railroad engineer may know little about sanitary engineering, and *vice versa*.

The necessary training for the practice of any of these branches of engineering must include a thorough study of the fundamental principles of several sciences and of mathematics and mechanics, and also a study of the

technical applications of these subjects and of the properties of the materials of construction. The engineer, also, should do more than make himself a mere technical adviser, and should broaden himself outside of the technical limits of his profession. More important than the question how a bridge shall be built is the question whether it shall be built at all. More important than the question how a railroad shall be located are the questions whether it shall be built and where it shall be located. If the engineer is to attain the highest success, he should qualify himself to answer questions such as these, which depend upon economic, sociological, administrative, and perhaps legal considerations.

The Course in Civil Engineering at the Institute is designed to give the student such a foundation in the general scientific branches and in their technical application as will equip him for the civil engineering profession. In addition to work in the class-room, there is much work in the drawing-room and in the field. The work of the civil engineer is largely out of doors, and a training in the art of surveying is necessary to enable the student to engage in the practice of his profession.

The civil engineer should be a good draughtsman, for his first work in the profession will be likely to be in the drawing-room. For this reason a training in drawing and design is given an important place in the curriculum.

The civil engineer must have a thorough knowledge of the fundamental principles of mathematics and mechanics and must be able to use them as a tool in the solution of engineering problems. He should, therefore, have a taste for those subjects and should enjoy applying them to practical problems.

Besides being trained in science and its application, the civil engineer, in order to be successful, must possess com-

mon sense and "gumption." That is to say, he must be able to perceive the true relation of things, he must see the proper data for his problems, and he must have the vision which will enable him to apply scientific principles properly.

The opportunities in the profession are large and are increasing daily; and any student who goes through the course with credit, so that his teachers can recommend him, will be almost sure, after graduating, of finding ample opportunity to apply his knowledge.

Mechanical Engineering

(*Course II*)

A YOUNG man who desires to ascertain whether he has a natural aptitude, and not merely a passing fancy for Mechanical Engineering, will probably inquire: What is the nature of the work which he will be called upon to perform, if he selects that profession; what is the nature of the training necessary to prepare him for it; what are the opportunities for employment immediately after his graduation; what will be the nature of his work at that time; and to what kind of positions can he hope to aspire.

The following considerations should aid him in answering these questions.

In all industrial enterprises, a very large portion of the work of organizing, and nearly all of the work of designing, constructing, and operating, falls to the lot of the Mechanical Engineer. Thus in any manufacturing establishment machinery must be built, installed, and operated, buildings and other structures must be erected, power plants must be established, heating and ventilating systems must be installed, and other engineering work must be performed, the arrangement, construction, and

operation being suitable for the purpose, and of such a nature that the work may be accomplished with the greatest efficiency and the least cost. All this is equally true whether the product is steel rails or shapes, machine tools, steam engines (whether stationary, marine, or locomotive), steam or water turbines, sugar, dye-stuffs, electrical apparatus, or anything else.

The Course in Mechanical Engineering, therefore, aims to equip the student to deal with general engineering problems; the instruction given in the class-room, in the drawing-room, and in the engineering laboratories being designed (1) to give to the student practice in such work as engineers, in the pursuit of their profession, are called upon to perform; (2) to enable him to base all his work upon sound principles, and not upon empirical rules; (3) to enable him, by means of a thorough familiarity with both the theoretical and the practical aspects of his business, to deal intelligently with other men; and (4) to teach him to perform original investigations; inasmuch as the ability to conduct them is of great importance to the practical engineer.

A great deal of research is carried on, partly in connection with regularly assigned laboratory work, and partly by means of theses, each of these being an engineering investigation on a practical scale. These investigations may be classified as follows:

(a) Those made in the laboratory itself.

(b) Those made at some outside plant.

In the case of the first, many have for their object the determination of results of value to engineers, manufacturers, and others engaged in industrial pursuits. The engineering laboratories are often the means of giving direct aid in solving industrial problems, such as deter-

mining the efficiency of new devices, or the relative advantages of different methods of construction.

In the second class, a part are such that the results are of so much value to the owners of the plant, that, in many cases, they have furnished the apparatus, and have gone to expense to fit it up with the adjuncts necessary for carrying on the investigation. In many cases, also, the investigations have been made for the purpose of solving directly some question affecting the business of the owner of the plant.

The work of the graduate when he first leaves the school will necessarily be of a subordinate character, as he must first acquire experience in practice which no school can supply. He will usually begin work in either the draughting-room or in the shops, as these are the natural channels that lead to higher positions, the former being in many establishments the department whence emanates the control of the entire works. Sometimes the graduate, immediately after he leaves school, takes a position as assistant to the person in charge of some department, and has more or less miscellaneous duties of a subordinate character, which may have to do with the constructing, the inspecting, the estimating, or some other department.

Another class of work, in which there is a large demand for graduates, is one where a man is expected to deal with both commercial and engineering matters, the engineering work being necessary to carry on successfully the commercial portion of the work.

Some of the positions to which the young engineer may eventually look forward are those of master mechanic, engineer of tests, constructing engineer, contracting engineer, superintendent of a department, superintendent of the works; if he has paid attention also to the business side of the work, he may become general manager, treas-

urer, or even president of the establishment. On the other hand, he may become an expert or consulting engineer, or a teacher.

As to opportunities for work, it will be sufficient to say that, notwithstanding the fact that the number of graduates in Mechanical Engineering is very large, the total number of those graduated in this department at the Institute being thus far nine hundred and twenty-four, the demand far exceeds the supply. Notwithstanding the general depression in business in the year 1908, all the sixty-one graduates of the course in Mechanical Engineering in June of that year had found employment by the middle of October.

Mining Engineering and Metallurgy

(Course III)

THE profession of mining engineering is perhaps the most composite in character of any of the so-called engineering professions. The location, development, and operation of mines calls into play to a greater or lesser extent, according to local conditions, the arts of the civil, the mechanical, and the electrical engineer, as well as those of the chemist and the geologist. While the metallurgical engineer is more nearly concerned with the treatment of the ore after it has passed from the province supervised by the mining engineer, he has still problems which have to be worked out by the arts of several co-ordinate engineering professions; and it also frequently happens in actual practice that the mining engineer is called upon to cover, in his professional capacity, much that lies more properly within the province of the metallurgist. Although it is out of the question to expect one man to be an expert in more than one or perhaps two of the

branches of such a profession, he must, if he is to attain a high rank as an engineer, be sufficiently familiar with the practice of these various branches to be able to use them in his work, and he must have such a true appreciation of their value that he may know when to fortify his own skill with outside help for the successful solution of any particular problem.

It follows, therefore, that a course of study designed to prepare a man for such a profession must first of all include thorough work in the fundamental sciences underlying the various kinds of professional work enumerated. It must also point out and illustrate, so far as time and opportunity permit, the methods of applying these sciences to the problems of the engineer. It is believed to be beyond the province, if not the power, of an undergraduate course of study to give the student a thorough training in fundamentals and at the same time to give him very much experience in the technical details of the profession which are obtained effectively only by actual and extensive professional experience. Emphasis is, therefore, laid upon training the students to do things scientifically and well rather than upon technical details. Furthermore, the best experience shows that the most favorable place to obtain such a training is in schools, where, as at the Institute, there exist strong courses leading to the other coördinate engineering professions, for there the student has the best facilities for contact with the latest and most highly developed results of engineering science and its application along the several closely related lines of work. Such advantages far more than offset those to be derived from mere proximity to great mining centres.

The Course in Mining and Metallurgical Engineering at the Institute has been divided into three options in

order to meet the requirements of men who wish some particular side of mining work.

Option I offers a broad training in the fundamental principles of chemistry, physics, mechanics, geology, mineralogy, petrology, and surveying, and in their application to mining and metallurgy. It aims to prepare a man to become a general mining engineer.

Option II, which is designed to fit one to take up work as a metallurgical engineer, devotes more time to the metallurgical, mechanical, and chemical studies, and less to geological work and to surveying.

Option III differs from Option I only in the fourth year, when considerable time is devoted to petrology and advanced geological work, instead of to a corresponding amount of mining and mechanical work. It aims to meet the needs of such men as desire eventually to pay particular attention to the geological examination of mineral deposits.

For those who have the time and money and who care to do so, the course may be extended to five years, thus giving a still broader and stronger preparation. Again, others who desire to pursue their studies further than it is possible to do in four years, prefer to complete one of the regular options and then to spend a fifth year in special study of such subjects as ore concentration, electricity, or geology.

In the summer vacations opportunities are afforded for elective work in practical mining, metallurgy, and geology.

The ever-increasing scale on which mining and metallurgical operations are being carried on, the opening up of new mining regions, the rejuvenation of old ones; the treatment of new kinds of ore, as well as the treatment of old ones by new methods, and the universal application of new discoveries in science and technology to the work-

ing-out of problems deemed almost impossible of solution a decade ago, — these furnish in mining, as in other professions, unequalled opportunities for properly qualified and energetic young men to advance rapidly to positions of responsibility and usefulness, accompanied by a correspondingly high remuneration.

Architecture

(*Course IV*)

THE successful architect of to-day must have a broad general culture, must be a master of design, and should possess a thorough knowledge of the principles underlying sound construction. He must unite, in a measure, the artist and the man of affairs, and at the same time be able to discuss scientific problems with mechanical, electrical, and sanitary engineers. He must be able to meet intelligently on their own ground the skilful artists with whom he is coming more and more in touch among carvers, modellers, iron-workers, glass-workers, and decorators, and must be ready at a moment's notice to turn from them to a consultation with the engineer as to the proper installation of a high-pressure boiler. The education of an architect has thus become of so complex a nature that it can no longer be given in the office, and because it is so specialized, it cannot be given even by one man. The school educates men to become eventually architects, not draughtsmen, and it should give the student only sufficient practical training to enable him to re-adjust himself quickly to the routine of an office. The school must teach theory; the office will give practice.

A broad general culture is a fundamental necessity because of the range of subjects on which architecture touches, and the classes of men with whom the architect

has to deal. The professional equipment includes artistic and historic studies in an even larger measure than those purely scientific, and the school devotes itself mainly to the theory of design, the cultivation of imagination, and representation. Scientific construction is continually becoming a more necessary part of an architect's education. His knowledge of it must be broad and thorough, and he must be scientifically trained to deal intelligently with all structural questions.

Whether the architect is prepared to accomplish all this himself or must be aided by other agencies, the fact remains that he is responsible for his building as a whole, not only for its decorative side, but its construction, its planning, and its final equipment with complicated systems of mechanical, electrical, and sanitary apparatus.

How is the student to be advised as to the possibility of his succeeding in this profession? At the age when his decision has to be made he will rarely show evidence of decided fitness for it. A fondness for drawing has not the importance so generally supposed. Drawing is simply the means of expressing the architect's ideas, a very important means, to be sure, but if the architect has not sufficient training to conceive ideas worth expression, draughtsmanship will not make up the deficiency. To those to whom the "call" has not come and who are diffident as to their qualifications for the making of an architect, it is fair to say that if they have strong inclination, love of hard work, and good common sense, they need not fear the attempt.

Chemistry and Chemical Engineering

(Courses V and X)

THE Courses in Chemistry (V) and Chemical Engineering (X) have as an object the education of chemists,

and accordingly include the fundamental subjects with which every competent chemist must be familiar. The science of Chemistry is so broad and its importance is so great in a wide variety of fields that it has seemed expedient to offer to the student an opportunity for a certain amount of specialization within the science, or, in order to equip him for the present demands in the field of applied chemistry, an opportunity to combine with his chemical training as much fundamental engineering knowledge as the time available will permit. With these ends in view, there are offered within the Course in Chemistry, three series of optional studies, the first of which comprises advanced work in general and physical chemistry, and additional work in mathematics and physics, with the particular purpose of equipping the student for the work of a teacher, or for efficiency in research work, in either college, scientific, or technical laboratories. The second series of optional studies includes some biology and a varied experience in special lines of analytical practice, and prepares the student for a career as general analyst, as in a railroad laboratory, or for the control of supplies and products of a manufacturing plant. The third series includes additional work in sanitary chemistry, bacteriology, general and industrial biology, and courses dealing with questions of public health and sanitation. It has for its objective the training of chemists who desire to devote themselves mainly to questions of municipal importance, such as the control of food and water supplies, and the disposition of waste materials, such as sewage. It is, in general, assumed that the student will, at the beginning of his second year of work, elect some one of these options, and follow it consistently throughout his course; but a change of option may be permitted for adequate reasons, and, moreover, the specialization is not carried

so far that it makes it at all imperative that a particular line of work should be followed after graduation. The fundamental training is common to all the options, and it often happens that the graduates make highly successful careers along lines quite different from those elected during their undergraduate years.

In the Course in Chemical Engineering a portion of the time devoted to chemical subjects and all of the time devoted to optional studies in the Course in Chemistry is devoted to such subjects as mathematics, mechanism, applied mechanics, steam engineering, elementary electrical engineering, and the drawing and laboratory practice necessary for the understanding of these subjects. The purpose of this course is to equip its graduates for positions in the technical field which involve a knowledge of chemistry and a knowledge of the fundamental principles of engineering practice. Such graduates generally assume laboratory positions at the start; and not only are they able to control, investigate, or devise manufacturing processes on the basis of experimentation and investigation in the chemical laboratory, but they are fitted to assume the responsibility involved in the development and superintendence of these processes on a manufacturing and profit-producing scale. They are also equipped to attack intelligently those problems connected with plants already in operation, which include engineering as well as chemical factors.

The demand for chemically educated men is active and seems likely to increase, for there is little reason to question the statement made by those competent to express an opinion, that chemistry is certain to play an increasingly important part in promoting the welfare of the industries and the prosperity of mankind, especially in our own country. This is partly because of the greater refine-

ment of processes as a result of keener competition and the exacting requirements of the consumers, but, in particular, because of the growing need for a conservation of resources and greater care of the interests of the community with reference to the proper disposition of wastes. This necessity must lead to a development of research laboratories, and also to an increasing appreciation of the service which the chemist with a knowledge of engineering can render both to chemical industries and to commercial interests in general. There is no profession which offers better opportunities to the capable man, or which, at present, is less crowded than that of the chemical engineer. There is a steady call for men trained as teachers or investigators, and also for those who can attack the increasingly important problems which associate themselves with the well-being of cities and states.

Electrical Engineering

(Course VI)

ANY branch of engineering is an exacting mistress for the man who makes it his profession; and this is particularly true of electrical engineering, which, having won its way into the processes of almost all of the great industries found in the nation, demands from its followers an extraordinary breadth and variety of industrial knowledge. The scope of electrical engineers' work may be indicated by many striking examples. For instance, both of our methods of quick intercommunication, the telegraph and the telephone, use electrical processes, and those of the telephone are so complex that they demand in their management a high grade of engineering skill. City and interurban traction systems have become a monopoly of the electric motor, and the heavy freight

traction over mountain divisions of steam railroads seems destined to soon come under the same influence. The electrical transmission of power has put artificial illumination of streets and houses on a plane never before reached or imagined. Even in the manufacturing industries, the use of electrical power has proved capable of increasing the output and economizing the cost of the product of many different kinds of works.

It is obvious that adequate training for a profession that brings its followers into contact with so many of the activities and nearly all of the industries of the nation must consist essentially of those principles which are fundamental to all. The Electrical Engineering Course is therefore made strong in chemistry, physics, mathematics, and applied mechanics, and these subjects are associated with study of machinery, stationary structures, hydraulics, and steam engineering. Along with these, extended study is required of the fundamental laws of electric current flow, the phenomena of electro-magnetism, and the ways in which these may be usefully applied in man's activities and particularly in industrial affairs.

An experienced engineer should have the ability to conceive, to organize, and to direct extended industrial enterprises. To attain this ability requires many years of mature experience, and an electrical engineering course that is expected to promote the highest ultimate accomplishment of its graduates must be largely occupied with teaching the principles of science, the meaning of known natural laws, and their relations to each other. Very little time can be given to processes of engineering practice which are of such a nature that they can be mastered with comparative readiness by observation after graduation. The course has sufficient scope in giving the knowledge of scientific principles and the command of processes

of analytical reasoning which can be obtained only by hard study.

The graduate who adds judgment, loyalty, and "gumption" to the qualities derived from this study of fundamental science has before him many possibilities of professional usefulness. In telephony the work is one of infinite detail; but it may lead to broad and comprehensive executive duties in connection with one of the great servants of commerce and civilization. In electric railroading is found a ruggedness of service that appeals to the imagination of many, and there are also in it opportunities leading to executive duties in a branch of industry that is the very backbone of commerce and modern civilization. Similar attractions are found in electric lighting and electric power transmission, and attractions of other natures are found in the manufacturing industries.

A man capable of deserving the highest positions within the sphere of electrical engineering practice must expect to become either a man of executive power or a man who originates new projects or machines. In either vocation he will find use for all of the general training in language, history, and political science which is included in the Electrical Engineering Course, in addition to the training in physical science.

Another occupation in which there is a demand for graduates of the Electrical Engineering Course is teaching. In a similar classification goes the work of enlarging the world's knowledge of useful electric and magnetic phenomena by a life of research.

Many of the duties to which an electrical engineer may be called are of a nature which demands a depth and strength of mental training which cannot be reached in the four years of an undergraduate course; and graduate instruction in electrical engineering leading to the higher

degrees of Master of Science and Doctor of Engineering provides the additional training particularly advantageous for men who desire to take up such duties.

Biology

(*Course VII*)

BIOLOGY offers a rapidly widening, attractive, and novel field of work for men of the right sort. Students to succeed in the profession must, of course, have the scientific turn of mind, but need not have the special bent for mathematics required in engineering construction. As the subject is so new, men taking it need to have the spirit of research; on the other hand, its points of contact with the public are so many that the ability to talk and to write well and to meet men easily is highly advantageous.

Most of the graduates of the Course in Biology are absorbed by the rapidly increasing demand for recruits in the campaign for pure water, pure milk, clean streams, and clean cities. The Institute has furnished much of the inspiration for the movement for sanitary reform now making headway all over the United States; and it is to the Institute that this movement still looks for some of its practical leaders. Much of the work needed in this line is research work, so that the scientific investigator has an important place. On the other hand, much of the present demand is for executive ability in the supervision of sanitary works, and in the organization of the campaign of popular education.

Men are also needed on the laboratory side in the experimental studies for new sewage and water works; in the control of those already constructed; and in the conduct of the bacteriological laboratories of state and mu-

nicipal boards of health. Industrial applications of biology to dairying, cheese-making, tanning, are taking their quota. For men of scholarly minds who want to teach, there are attractive educational openings; half a dozen of the great universities are at present planning departments of sanitary science somewhat along the lines of the Biological Department of the Institute. Consulting Laboratories for biological and sanitary work offer an excellent commercial opportunity for men of a business turn. Finally, there is a splendid field for men of administrative ability in the executive departments of city and state boards of health and in the scientific bureaus of the United States Government.

Physics

(Course VIII)

THE Course in Physics was established by the Corporation of the Institute in 1873, acting on the initiative of Professor Edward C. Pickering, then Thayer Professor of Physics. The Course in Natural History, now the Course in Biology, was established at the same date. These two were the first additions to the original six Courses with which the School of Industrial Science opened. At that time no course leading to a degree in physics was offered in this country, and there was but little opportunity for a student desiring to pursue systematic studies in this and allied branches of science, the instruction then given in the various colleges being almost entirely confined to elementary lectures designed for all undergraduate students alike. A full line of study was laid out for the Course in Physics, being equal in extent and thoroughness to the courses leading to the engineering or other professions. From the date of its establish-

ment the requirements for graduation have been somewhat severe, especially because of the necessarily large amount of chemical and mathematical studies which are included, requiring a rather extended range of ability on the part of the student.

The Course aims primarily to prepare students for the profession of scientific teaching, and likewise to train competent men to become investigators of physical problems, either in pure physics or in its industrial applications. The mathematical and chemical studies required in addition to the purely physical subjects give knowledge and training in a very broad field, so that the graduate is well qualified to enter upon the work of instruction in secondary schools of the highest grade, either in physics, chemistry, or mathematics; or for proceeding to an advanced course of study in preparation for a higher degree, as that of Doctor of Philosophy or Doctor of Science, if he desires to prepare himself for more advanced work in the line of teaching.

The Course in Physics also gives a suitable preparation for one intending to enter upon the work of scientific or technical investigation in industrial establishment or in the service of the United States, as, for example, in the Bureau of Standards at Washington. It likewise furnishes a very thorough and extended scientific training, regarding this as an educational end in itself.

The nature of the various kinds of work for which a student graduating in Course VIII is particularly fitted will perhaps best appear from a consideration of the occupations in which its graduates are actually engaged, of whom there have been fifty-one up to and including the Class of 1908. Twenty-one of these have devoted themselves to teaching, chiefly as professors or instructors in institutions of collegiate grade, seven are engaged in purely

scientific research as astronomers, several are in the United States Bureau of Standards, and a number in various kinds of business related to the scientific industries.

Sanitary Engineering

(Course XI)

SANITARY ENGINEERING rests upon Civil Engineering, and is, indeed, a branch of that profession, — a specialty, just as Bridge, Railroad, Irrigation, and Water-Power engineering are other specialties. As suggested by its title, its field is the design, construction, and maintenance of works for the promotion of public health. Especially it has to do with projects for supplying suitable drinking-water to cities and to smaller communities, for removing and purifying sewage, and for draining land for sanitary purposes. The warming, ventilating, and draining of buildings, the cleaning of streets, the collecting and disposal of garbage and other city wastes are also fairly within its scope, as are questions of stream pollution and numberless special matters connected with public health which come up wherever population gathers.

It is, however, with problems of water-supply, sewerage, sewage disposal, and drainage that the specialist in sanitary engineering is most prominently identified. Such projects call for the construction of intakes, filter galleries, dams, sedimentation basins, filtration plants, pumping stations, canals, aqueducts, main pipe lines, distribution systems, stand-pipes, sewers, drains, outfall works, and a multitude of minor appurtenances.

Noteworthy recent examples of sanitary engineering are the Chicago Drainage Canal; the Columbus, Ohio, sewage filters; the water purification works of Cincinnati,

Pittsburg, Philadelphia, and Washington; the water-supply and sewerage works of the Boston metropolitan district; the drainage works of New Orleans.

In large measure the engineering works required for sanitary ends do not differ materially from similar works which are to serve other purposes, — dams, pipe lines, canals, for example. With the development of modern methods of purifying water and sewage, however, in which chemical and biological processes are involved, it has come to be necessary, both in the studies and experiments preceding the choice of work and in the adaptation of the works themselves, to have a thorough knowledge of chemistry and biology and of the discoveries and experiments which have been made along these lines.

To supply training in these two lines is the primary reason for setting off at the Institute a distinct course in Sanitary Engineering. A secondary reason is to permit to those students who may desire it some limiting of their engineering training toward strictly sanitary works. Course XI is characterized, therefore, by the introduction of a moderate, but sufficient amount of biology, and of a considerable amount of chemistry, into the curriculum of Course I, and a corresponding diminution of the time devoted in the latter course to purely engineering subjects. Less completeness of training in Structural and Railroad Engineering is therefore to be obtained in Course XI than in Course I, and somewhat less in Topographical Engineering, although good basic instruction is afforded in each of these lines. The student who elects the Course in Sanitary Engineering should possess an aptitude and disposition to do good work in chemistry and biology. If he has these qualifications and wishes to specialize in the direction indicated, he may fit himself in this Course to meet creditably the requirements usually put upon the

young graduate in any line of sanitary engineering. If he choose to remain an additional year at the Institute, he may strengthen himself greatly on either the engineering or the chemical side, or on both, with excellent opportunity for advanced study at the Sewage Experiment Station of the Department of Biology.

Graduates of this Course are to be found holding positions either as principal or as assistant engineers in private consulting practice; in the engineering departments of state boards of health; with water supply commissions; with water purification and with sewage purification plants, both under construction and in operation; with sewer, street, and general engineering departments of cities; in sundry branches of national and of state engineering service; as professors and instructors in sanitary or in civil engineering; as health officers, contractors, sanitary inspectors, and so on.

The opportunities for employment immediately following graduation vary with the state of general business and with the activity of engineering construction in particular lines, and probably are not greatly different from those in other technical branches. The earlier positions call for service of minor responsibility on surveys, inspections, computations or draughting in the offices of consulting engineers, municipal or state boards, or on works of construction, beyond which advancement is governed mainly by individual qualifications and opportunity.

Naval Architecture

(*Course XIII*)

THE term Naval Architecture is so well established that it better represents the nature of the course of instruction so named than any other; yet the evident

meaning of the term should be extended to include much that is not commonly associated with it. The Course is intended for those who expect to be ship-designers, ship-builders, ship-managers, or marine engine builders, including designers and builders of marine steam turbines and marine internal combustion engines.

When ships were built of wood, and the towering poops and forecastles of the three-deckers were treated architecturally, the relation to architecture was evident; now that ships are constructed largely of steel and crammed with engines, the relation to engineering is what is most striking. But the artistic side of the designing of real ships, and especially of yachts, has never failed to appeal to those to whom a ship is more than a conveyance.

Marine engineering began when engines were first used for propelling ships. Growth in size and complication, accompanied by a more exact adaptation of a ship to its service, has gradually called for a broader grasp of the principles of ship and engine building, as well as for specializing along narrow lines for ship-yards and ship-builders. It is desirable that some ship-yards should build warships, some passenger ships, and others freighters. Torpedo boats, yachts, and motor boats call for even further specialization.

It will thus be seen that the field is wider than might appear at first, and that there are opportunities for a variety of capabilities, the trend, as in general engineering, being towards the employment of specially trained men. Since, however, all the trades are represented in the construction of the modern ship, it is doubtful if any other profession calls for such an intimate knowledge of so many different industries. The design requires, in the first place, a knowledge of abstruse mathematics combined with data obtained from experimental work; and not the least

important factor, particularly in the use of the "indeterminates," is that rare quality, good judgment. Draftsmen and mould-loft experts coöperate with the scientific computer and prepare the plans and models for the construction department. Here the engineer must be conversant, not only with shop-work in all its branches, but with steel manufacture, foundry practice, steam engineering and electricity. A naval architect who confines his work to the designing and building of yachts must, in addition to a general knowledge of ship-yard requirements, have had considerable practical experience in the handling of small boats.

All the ships of the sea, however numerous and costly, are to be counted as but a fraction of the structures on land; and while the combined engineering schools of this country can scarcely supply the demand for technically trained men for this larger work, relatively small departments in a few institutions suffice to supply the need for naval architects.

Electrochemistry

(Course XIV)

THE Course in Electrochemistry, first established as a distinct option in the Course in Physics in 1901, was, it is believed, the first of its kind to be offered in this country. The curriculum of studies constituting this course was in 1909 designated as Course XIV.

The profession of Electrochemistry, for which Course XIV provides the training, is one of comparatively recent origin, being in fact one of the youngest of the professions in applied science. It has arisen as a natural result of the rapid development of electrochemical industries both in this country and abroad, and it was to meet the increasing

demand for men properly trained to enter these industries that the Electrochemical Course was originally established. These industries may be briefly described as embracing those in which electrical energy is utilized, either directly or indirectly, as the source of power in effecting chemical changes, and, conversely, those in which chemical energy is transformed into electrical energy. With the realization of relatively cheap electrical power in enormous quantities, as, for example, that developed at Niagara Falls and other water-power centres, the possibility of manufacturing on a commercial scale many substances which a few years ago could be produced only at prohibitive cost or which were entirely unknown has become an accomplished fact. The calcium carbide, aluminum, graphite, carborundum, and caustic soda industries are instances of the remarkable development of electrochemical processes in recent years; while many other chemicals are now most economically produced by electrochemical means. The application of Electrochemistry to metallurgical processes is also making rapid advances, not only in the refining of metals, but also in their reduction from their ores. One of the most important recent developments is the application of the electric furnace to the production of high grade steel.

Electrochemistry is essentially an experimental science, and the problems which it presents for solution are in many cases distinctly novel. To cope successfully with these, the qualifications which an electrochemist should possess are: first, a thorough knowledge of the principles of Theoretical and Applied Electricity; second, an equally thorough foundation in Theoretical, Analytical, and Applied Chemistry; third, and perhaps most important of all, the ability to apply such knowledge to the solution of unsolved problems. The student electing the Course in Electrochemistry should, therefore, possess good ability

in mathematics (as Theoretical Electricity is essentially Applied Mathematics), and should have a distinct natural aptitude for experimental work. Much of the instruction is given in the laboratories of Chemistry, Physics, Heat Measurements, Assaying, Metallurgy, Electrical Engineering, and Electrochemistry. In 1901, when the course was established, the Institute equipped a special laboratory with every facility for instruction in all branches of Theoretical and Applied Electrochemistry and for research work. Great emphasis is also placed on the theoretical and fundamental principles underlying both the electrical and the chemical sides of the science. The training given in the course is in fact so broad that a graduate should be well prepared to undertake successfully many lines of purely electrical or chemical work other than Electrochemistry, if he so desires; and that this is the case is shown by the varied kinds of work at present being undertaken successfully by recent graduates. Thus, of the twenty-two graduates in this course up to and including the Class of 1908, seven are engaged in strictly electrochemical industries, six in various branches of Electrical Engineering, while the others are engaged in general manufacturing, scientific research, United States Government employ, and in teaching.

Abundant opportunities are open at the present time for able men trained as electrochemists, but only those students are advised to elect this course of study who combine ability in mathematics and in experimental work. For such students the curriculum of Course XIV offers an interesting and valuable course of study.

UNDERGRADUATE LIFE

The Union

THE idea of a general meeting place for students originated with President Walker during the last part of his administration. Though he did not live to see the fulfilment of his project, his plans were carried on and developed by the Alumni, who financed to the extent of nearly a hundred thousand dollars a plan for the Walker Memorial Gymnasium. Owing to the agitation over a new site and the Harvard Merger, nothing could then be done in the way of a new building.

President Pritchett understood the social needs of the student body, and at his suggestion some friends of the Institute gave the necessary funds for furnishing temporarily two rooms in the Mechanical Laboratory on Garrison Street for this purpose. Here was the first Tech Union.

Although supplying a great need, these rooms were miserably inadequate as a social gathering-place for fourteen hundred students, and this fact was pointed out by Acting President Noyes in his report to the Corporation in December, 1907. As a result of his suggestions and of a movement among the students to secure better quarters, the Corporation, through its Committee on Student Welfare, approved plans for the building of an entirely new structure, "a social centre for the students at the very doors of their lecture-rooms and laboratories." The building was made possible in great part by Alumni and friends of the Institute, who subscribed a total amount of \$8689;

the remainder of the \$19,460.37 necessary for planning, constructing, and furnishing the Union, was obtained from an appropriation from the Alumni Income Fund.

The New Union was opened to the students on September 30, 1908. It is a two and one-half story structure, occupying the space between Pierce Building and Engineering C. The lunch-room, seating about three hundred, is located on the ground floor, the kitchen being in the basement of the Pierce Building. This dining-room serves a second purpose as a stage for the rehearsals of the Tech Show. On the floor above is the social room, with its large fire-place, upholstered easy-chairs and window-seats, a piano, former Tech Show pictures and posters, class banners, periodicals and books, including the Frank H. Cilley Library, containing books devoted to physical culture. On the street side of the second floor are the library or study-room and a special dining-room which during the day can be used for cards and other games.

To provide office room for the various student activities, there are three small rooms in the half-story above the second floor. One of these is now occupied by the Institute Committee and Track Team Management, another by the Tech Show, and the third by Technique. The Tech has its office just off of the living-room in the hall of Engineering C.

The management and responsibility are in the hands of a committee of four undergraduates, assisted by Dean Burton, and the assistant to the President, who act only as an advisory board. This is called the Union Committee. There are three sub-committees, composed entirely of undergraduates, namely: The Dining-Room, House, and Entertainment Committees. The Dining-Room Committee keeps in touch with the management of the dining-room, and tries in every way to improve the din-

ing facilities; the House Committee is responsible for the success of the upper floors, assigns office room to various organizations, also special dining-rooms for dinners of professorial and social societies, cares for magazines and books, while each member is assigned a certain day in the week when he is to see personally that the privileges of the social rooms are used and not abused; and the Entertainment Committee has charge of the Friday Night Entertainments. The Institute Committee elects the four members of the Union Committee, which in turn elects as members of the sub-committees those men who have been recommended by the various committees. These sub-committees meet once a week and the chairman of each reports at the monthly meeting of the Union Committee of which he is a member. This method of committee government insures the Union being run for the students and by the students, and affords a most excellent opportunity for the development of the executive training so much needed by the technical graduate. The Union has been thrown open to the use of all, with no fees and few restrictions.

The Union has proved as convenient and comfortable as any clubhouse. To one who has watched the growth of Technology even for but a short time, the great change wrought by the new Union in the social condition of its students is evident to a marked degree. Men of different classes and from different parts of the country are brought into more intimate contact with each other, and the Friday Night Entertainments, consisting of talks by such men as Rabbi Fleischer, Lyman Underwood, District Attorney Hill, Professor Sedgwick, Lieutenant Tardy, of the U. S. S. *Vermont*, Vice-President Sears of the National Shawmut Bank, and

many others, together with such entertainments as Hook Night, the Christmas Entertainment, and the Open House for the New England Intercollegiate Athletic Association, given the night before the finals of the New England Intercollegiates, have furnished opportunities for developing the social side of life, before impossible. In other words, the Union has paved the way for that ideal of social life to be realized by the Walker Memorial in the "new Technology upon a new site."

Fraternities

GREEK letter fraternities have been in existence at Technology since 1873, and have constantly increased in number and influence. In spite of struggle and adverse criticism they have consistently demonstrated their right to existence. Nor is the secret of their success hard to find. The idea upon which they are founded is sound and good. For a fraternity is a "banding together for mutual interest and affection," which fosters "a brotherly regard and sympathy for one another, regardless of relationship by blood." The very word fraternity suggests friendship, and friendship is indeed the keynote of fraternity life.

Literary or professional societies promote comradeship, but they lack the bond of obligation of one man to another which the fraternities enjoin upon their members. This bond, by adding to good fellowship mutual helpfulness, is most effective in promoting those friendships which play so essential a part in the life of a man. Herein lies the remarkable strength of the fraternities.

At Technology fraternities have a more important function than in most of the colleges of the country. The standard of scholarship at the Institute is high. The stu-

dents are continually with serious purpose endeavoring to acquire the valuable scientific training which Technology offers. Time and opportunity for interests outside of routine work are more limited than in many schools. But, as has well been said, "technical proficiency is not enough to insure the highest success. A man must not only be a good engineer, he must also know how to deal effectively with men."

The fraternities do much to keep before the students the importance of social as well as mental development. By giving their members the opportunity to come into contact with a group of men of diverse traits, they develop that knowledge of men which is essential for leadership.

The Institute does not at present provide dormitories. The fraternities, however, most of which maintain chapter houses, have given their members comfortable homes and pleasant companionship. The homelike environment of the fraternity house is much to be preferred to the conditions in the average student boarding-house.

The advantages of fraternity life are enjoyed by an increasing proportion of the students at the Institute. The membership, which in 1885 was less than ten per cent of the student body, has now increased to about twenty-five per cent. The fraternity members now number about three hundred and fifty, distributed among more than fifteen fraternities. All but two or three of the fraternities support chapter houses, and these are located in the best residential districts of Boston. Conditions of life as regards rooms and food are much more desirable than in the boarding-houses, and the cost is very little more.

The charge has been made against fraternities that they promote riotous living. Prof. George V. Wendell, who, when he was connected with the Institute, was actively interested in undergraduate life, pointed out that such

"charges are usually made by men who have neither enjoyed the advantages of fraternity life nor investigated the conditions that prevail. The criticism is the more serious because of the injustice it does to a large number of young fellows who are striving to uphold the ideals of their chapters and of the Institute, and who desire to win the respect and regard of the instructing staff and the student body." Tendencies to riotous living are curbed, not encouraged, by the fraternities at the Institute. In five of the fraternity houses no liquor of any kind is allowed; two have no rule in regard to the matter; and the others allow beer only on special occasions. The honor of upholding the reputation of the fraternity is dear to the fraternity man, and he carefully watches his own actions and those of his comrades. For the younger undergraduate especially, whose ideas of what a college man may do are often vague and fantastic, the advantage of being in intimate contact with the older men experienced in college life is obvious.

Nor is fraternity life detrimental to good scholarship. It is of distinct advantage to the fraternity to have all its members remain at the Institute, and to complete their courses. Here, again, the desire to uphold the honor of the fraternity is a keen incentive to good work. There is abundant opportunity for good fellowship at the chapter houses, especially early in the evening after dinner, when music and varied diversions are heartily indulged in. But many of the fraternities at Technology have an understanding, either written or unwritten, that the house shall be quiet after eight o'clock, so that those wishing to study may work to full advantage. Some of the fraternities exercise rather a careful supervision over the scholarship of their members. Upper-classmen scrutinize the records of the lower-classmen, and where these are unsatisfactory

they impress upon the delinquents their duty and responsibility to themselves, their parents, and their fraternity to improve their work. The older man has recently travelled the same path that now lies before the Freshman. If the younger man is having trouble with his work, the upper-classman, on account of his experience and because of his close and friendly relation in the fraternity, is able better than teacher or parent to help overcome the difficulty, be it in the work or in the man.

It may safely be said that practically all the fraternities have the best interests of the Institute at heart. There is very little of that social jealousy between fraternity and non-fraternity men which crops out at colleges where the purposes of the students are less definite and serious. The relations of the fraternities to each other are most cordial. Several smokers are given each year, at which members of the Faculty, men from the various fraternities, and the non-fraternity men of the student body get closely in touch with each other. The chapter houses are open to friends, and more or less entertaining is done through functions similar to those in any home.

The fraternities tend to keep high the morale of the student body. Moreover, they vie with one another in having representative men engaged in all branches of student activity, and urge their members to assume the responsibilities of active leadership and service in undergraduate affairs. And after graduation the fraternity is a connecting link that helps to bind the alumnus to his Alma Mater by keeping him informed of Technology affairs and by bringing him back to annual reunions. So fraternities foster a healthy, vigorous Tech spirit, and do splendid services for the Institute, while at the same time they are maintaining their own standing and honor. It is a happy combination.

The fraternities are of two classes, national and local. The national fraternity has chapters in many colleges throughout the country; the local has but the one chapter. Each has its advantages and is strong in its own way. The organization and management of each fraternity lies within itself alone.

Men are taken into fraternities from all the classes, and great care is exercised in the selection of new members. The new man at Technology may be asked by a fraternity man to take lunch or dinner with him at the fraternity house, particularly at the beginning of the school year. The invitation should be accepted, though given by an entire stranger, for it is to the new man's advantage to see as many of the different fraternities as possible. Should he be asked to join more than one, it is well for him to consider all sides of the question with the greatest care, for if a mistake is made the effect is harmful to both the man and the fraternity.

Clubs and Societies

BESIDES the fraternities, there are at the Institute a number of clubs and societies. Some of these are secret or partly so in character; but the majority are very open and democratic. The societies which are more or less secret are the following:

Osiris. This is the Senior honorary society.

Round Table. A Freshman-Sophomore society, which meets and has dinners about once a month. The purpose of the society is to promote good fellowship. It is one of the oldest clubs at the Institute.

Hammer and Tongs. This is very similar indeed to Round Table, the only distinct difference being that it is a Junior-Senior society. Its purpose is the same as that

of the other, and it was established at about the same time.

K₂S. This is a secret society devoted to the development of chemistry and allied subjects. Smokers are held in the society's rooms every two weeks, at which members of the Faculty or other scientific men are invited to speak on technical or scientific subjects. In addition papers are prepared on such subjects by members and read at the meetings. The society was founded in 1883, and is composed of students in the courses of Chemistry, Chemical Engineering, Mining Engineering, Biology, Physics, and Sanitary Engineering.

Masque. This is a body of thirteen active members of the Tech Show, whose aim is to raise the standard of the show.

Cleofan. Cleofan is the girls' club at the Institute, its object being to foster fellowship among women students at Technology. It was established about 1890 as a secret society, Eta Sigma Mu. Since its organization did not seem sufficiently democratic, all women studying at the Institute were made eligible. Cleofan gives two receptions during the year at the Margaret Cheney Reading Room, which it has the privilege of using. One is given early in the year to the Faculty, and the other is given during Junior Week to friends of the Institute and friends of Cleofan. The society desires to be of service to all young women coming to the Institute, and is glad to do what it can to fit into the whole fabric of Technology social life.

The following organizations are of practically open membership and are very democratic in their nature:

Geographical Clubs. The British Empire Association; The Southern Club; The New York State Club; The Pennsylvania Club. The aims of these clubs are the same, — to promote good fellowship and to enable the fellows

from different parts of these various territories to know each other better. The meetings are usually held in the Union. Any one who comes from any part of the British Empire or who is an English citizen is eligible for membership in the British Empire Association; any student from the South may become a member of the Southern Club; for the two state clubs, one must be a resident of the state to be eligible for membership.

Preparatory School Clubs. Phillips-Exeter; Mechanic Arts High School; Brookline High School; Newton High School; Boston English High School. The aims of these clubs are very similar to those of the geographical organizations. Meetings or dinners are held frequently, and the clubs try to be of service to Freshmen coming from the several schools. The Brookline High School Club is a little different from the others in that it holds its meetings at the homes of the members, each member entertaining the club once during the year. This is made possible by the fact that the membership is small and the fellows live near together. The other clubs make use of the Union or hotels for meetings. To be eligible for membership to any of these clubs, one must have been a former student in the school.

The Rifle Club. The Rifle Club holds shoots frequently at ranges near Boston and the members are permitted the use of the U. S. regulation army rifle. Any student interested may become a member.

The Chess Club. Games and tournaments are held frequently, and occasionally games are arranged with outside experts and with other colleges. Membership is open to all students interested.

The Walker Club. The Walker Club was founded in 1895 by the students of Course IX, then the Course in General Studies, to occupy the same place with them as

the professional societies have with the members of the professional courses. The club was named for President Walker because of his interest in this Course.

One of the chief activities of this club in its early years was the giving of short plays. Beginning in 1897, plays were very successfully given for several years, till the advent of the Minstrel Show, followed later by the Tech Show. The Walker Club did not wish to interfere with the success of a show which should be representative of Technology as a whole, and withdrew from the field.

When the Course in General Studies was dropped in 1904, it was decided that the Walker Club ought not to die with it. Accordingly the members of the last class of Course IX elected to membership in the club men from other Courses who showed an appreciation of the value of broad interests in the education of an engineer. The club has since been continued in accordance with this plan, electing its members from the three upper classes.

The activities of the club are such as make for the good fellowship of its members on the basis of broad general interests. The members dine together about once a month, and listen afterward to a talk, of a non-professional nature, by a member or guest of the club. Occasionally the club holds debates with the Civic Club, or with one of the professional societies. In addition, the club, in conjunction with the Technology Club, gives a reception early in the fall to welcome the new men coming from other colleges to complete their course at Technology.

Y. M. C. A. The Institute branch of this Association was organized by the students in 1895. The object, here as elsewhere, is the promotion of Christian fellowship and service among the undergraduates. At the beginning of each school year the Association presents a small handbook to the incoming students and others who may wish

one. The handbook contains a list of student activities and general information concerning the Institute.

A list of recommended rooms is prepared each fall by the Association and placed in the hands of the Dean. Through this list many students are enabled to secure comfortable quarters within their means, without the necessity of a long, unsatisfactory search.

One of the biggest social events of the year is the annual reception to the Freshmen given by the Association soon after the opening of the fall term. At this reception the new students receive their first glimpse of real Institute life. Talks are given by the Dean and other members of the Faculty and by the heads of all the larger student activities, as Technique, The Tech Athletics, the Musical Clubs, etc. Many pleasant acquaintances are formed at this reception.

The Association holds weekly meetings on Sunday evenings in the Union, to which all are welcome. Interesting speakers are provided, and discussions on practical and profitable subjects are given. For those who care for the study of the Bible, special religious classes are formed.

Membership in the Association is open to all interested in the work. At present there is no membership fee, the Association being supported by the members and a general canvass of the Institute.

The Catholic Club. The Catholic Club was founded in 1905 for the purpose of bringing the Roman Catholic students at the Institute into closer contact with each other, "in order to prevent them from drifting from the ideals nurtured in their homes." During the year numerous speakers are obtained to address the members of the club and such students as care to be present, on subjects of general interest. The club at present has a roll of over seventy members.

Brotherhood of St. Andrew. The Technology Chapter of the Brotherhood of St. Andrew, a national organization of men in the Protestant Episcopal Church, was founded in March, 1908. The chapter at the Institute is carrying on its work by aiding the Y. M. C. A. in every way possible, and by holding weekly meetings during the greater part of the school year, at which Dr. Mann, the Rector of Trinity Church, leads discussions on subjects of vital importance to Christian belief. These weekly meetings are open to all students at the Institute. Business meetings of the Brotherhood are held once a month during the school year.

The Professional Societies. There are at the Institute eight professional societies, representing, in a great measure, the different professional Courses, and composed of students who have chosen those Courses. They are: The Civil Engineering Society, The Electrical Engineering Society, The Mechanical Engineering Society, Mining Engineering, Architectural, Chemical, Biological, and Naval Architectural Society. These organizations are entirely in the hands of the undergraduates, the Seniors taking the lead, with the help of the Juniors, and the Sophomores taking no active part.

Two main objects were sought in the founding of these societies. The first was to bring before the men the practical side of the work that they were studying. In a city like Boston it is not difficult to secure men as speakers who, from their practical experience, stand at the head of their profession. The subject discussed has generally a direct connection with the work the men are taking at the Institute. In this way the younger men are able to secure a clearer idea as to what the profession which they have chosen includes. The informal discussions give an oppor-

tunity not only to ask questions, but to know the leading men in the profession.

The second purpose of the societies is to bring the men in closer touch with each other. They are a means of joining together a group of men with a common interest in a social as well as in a professional way, with class distinctions broken down. It was also desired that the men might become better acquainted with their instructors in thus meeting them outside of the routine work. By these means the societies are helping their members to know men as well as machinery.

The different societies generally elect their officers annually, although in one or two cases it is done biannually. These officers include a president, vice-president, treasurer, and secretary, with various committees, such as the Executive Committee, the Program Committee. The president, by representing the society in the Institute Committee, brings the society in touch with all other undergraduate activities. The meetings in general are of two kinds: informal discussions where an outside speaker is secured and where light refreshments are served; and the regular dinners held at stated times during the year. The informal gatherings are usually held in the Union; the dinners are usually held at a hotel, and talks of a general nature are given.

Besides these regular meetings, some of the societies carry on other activities. The Architectural Society is keeping in touch with the Alumni and what they are doing by means of a card catalogue, which is kept up to date by a committee appointed each year. One man is also appointed from this society to coöperate with a committee chosen by the Institute Corporation to publish during the school year the *Architectural Record*, a periodical that is sent to many architects throughout the country. This

society and the Biological Society hold a reception during Junior Week. Excursions to manufacturing plants, power houses, and important constructions, are planned and conducted by the societies. By all these means the societies have come to play an important part in the undergraduate activities.

In all the societies, students in the three upper classes are eligible to membership. In only one is there any special requirement. Before becoming a member of the Architectural Society, a man must submit a cloth tracing of some architectural or art object assigned by the society. The entrance fee and the dues for all the societies are small.

A student does well to connect himself with some one of these societies as soon as he becomes eligible. Membership in one of them gives him greater interest in his work, helps him to form friends, and gives him a clearer idea of the profession he has entered and acquaintance with men actively engaged in that profession. To hold office increases all these advantages, for he has a double incentive to make progress along the lines of his profession and to become better acquainted with his instructors and fellow-students. Yet the success that each society has secured is due to the interest shown by the men as a whole in the society.

The Musical Clubs. The Institute is at present represented by four musical clubs: The Orchestra, the Glee Club, the Mandolin Club, and the Banjo Club. Of these the Orchestra and the Glee Club are the oldest, both having been founded in 1884. The Glee Club prospered and has increased steadily in importance to the present day, but the Orchestra failed after a three-years' struggle and was only revived in the fall of 1908. In 1886 a combined Mandolin, Banjo, and Guitar Club was founded;

but the following year it broke up into two separate clubs, the Mandolin and the Banjo, and these have flourished.

The clubs are composed of from ten to twenty members, the number being largely governed by the available material. Each club has a leader and a manager, and the combined clubs, since they work together for the most part, have a president, a secretary, a general manager, and combined clubs, since they work together for the most arduous duties, since it falls to them to make the arrangements for all concerts, and to take charge of all the clubs' funds.

The requirements for admission to the clubs are not strict, about two years' practice and a reasonable amount of skill being as a rule enough to enable a man to make the instrumental clubs, and a reasonably good voice combined with a capacity for carrying a tune being the principal requisites for the Glee Club. Trials for candidates are held in the fall after the first few rehearsals. Notices of these trials are posted on the bulletin boards in the Union and in Rogers a few days before the time set. A deposit of five dollars (\$5.00) is required of all club members. From this is deducted fines for cutting concerts and rehearsals as well as for tardiness. At the end of the year or at any time when a member withdraws from the clubs the balance is returned to him. In addition to this there are dues of one dollar (\$1.00) a year, with a one dollar (\$1.00) initiation fee.

The concerts consist for the most part of popular music. A series of concerts is given in Boston and the suburbs during the winter and early spring. Those held in Boston are three in number: the "Winter Concert," given near Christmas, the "Spring Concert," given during Junior Week, and the "Senior Concert," given during Senior Week. Nearly all concerts are followed by danc-

ing. The proceeds go to pay for the annual Musical Clubs' Dinner, usually held at some one of the hotels in Boston about the middle of May.

The Institute Committee

THE student government of the undergraduates at the Institute is in the hands of the Institute Committee, a body representative of every important student interest. Its membership of twenty-six is made up as follows: two members are elected annually by each class; and the presidents of the four classes, of the Athletic Association, and of the Y. M. C. A., the general managers of Tech Show, and of the Musical Club, the editors-in-chief of *The Tech* and of *Technique*, and the presidents of the eight professional societies are members *ex officio*. Thus the expression of the sentiment of the whole student body is assured in its actions.

Once a month the Committee meets for action, material for meetings being prepared by an executive committee of five upper-classmen, which meets weekly, and the function of which is to keep constantly in touch with every branch of student life for purposes of investigation and constructive criticism.

Details of operation and administration are cared for by standing or by special committees. Thus the Union is managed by a committee, under which are sub-committees separately responsible for the dining-room, for the social rooms, and for the weekly entertainments. Another standing committee enforces the point system, while still others maintain bulletin boards and conduct the student calendar. Special committees, appointed from time to time, report on special investigations, or confer with the Faculty or Alumni on matters of joint interest.

An instance of the Institute Committee's activity is the recent engagement of a stenographer, and the opening of an office in the Union to do bookkeeping, stenography, and typewriting. The accounts of the most important student activities are now kept there, and the office has been found most convenient for all students or organizations having clerical or stenographic work. The rates are very reasonable, and the office is open to all connected with the Institute.

Thus the field of the Institute Committee includes all matters concerning or affecting undergraduate society, the success of student enterprises, and the relations of the student body within itself, and with the Faculty and the Alumni. Its efforts are constantly directed to the closer union of the undergraduates, and the development of a healthy Technology spirit. To these ends it welcomes at all times criticisms of existing conditions, requests for investigations, suggestions for improvements; in fact, opportunities for the advancement of student interests along any line. A suggestion box is kept in the Union to receive such communications.

Class Organization

THE organization of the classes at the Institute is not at all complicated, and to understand the manner of conducting the undergraduate activities connected with any one of the classes is practically to know all. The constitutions of the Junior and the Freshman classes, and of the Senior and the Sophomore classes are alike, for it has become an unwritten law that the incoming Freshman class adopt a constitution similar to, if not identical with, that of their guardians, the Juniors.

The first meeting of an incoming class is called by the officers of the Junior class for the purpose of bringing the Freshmen together and organizing them for their Field Day preparations. A temporary chairman and secretary are elected, as well as managers for class Football, Relay, and Tug-of-War teams. The candidates are nominated at large by the class, and when their nominations are seconded, are called up on the platform or stand before the meeting. The voting then takes place by a rising vote, and a plurality elects. The newly-elected chairman holds office until the regular class election, which takes place not later than the fourth Saturday of the term. He presides at all meetings, superintends class preparations for Field Day, and in general supervises class work. The Chairman also appoints the committee for counting ballots and carrying through the regular class election of officers.

The temporary Secretary keeps the minutes of the meetings and, until the election of the regular Secretary, acts as assistant to the Chairman. He also attends to the printing of ballots for the class election and receives all nominations, each nomination requiring the signatures of ten members of the class.

After this election the new officers immediately take charge of their duties. The officers elected are President, Vice-President, Secretary, Treasurer, also two members of the Executive Committee, five members of the Athletic Association and two members for the Institute Committee. The odd year classes also elect an extra officer known as the Clerk.

The duties of the President, Vice-President, Secretary, and Treasurer require no explanation, as they are in no way peculiar to the Institute organizations. The Clerk

of the odd year classes acts as assistant to the President, posts class notices, etc.

The two members who are elected as the Executive Committee, with the President, Vice-President, Secretary, and Treasurer, form what is known as the Board of Directors. This Board directs and sanctions the expenditures from the treasury to a limited amount, which is constitutionally determined by each class. The Board also has charge of all class elections and all social and general affairs of the class.

The five men elected to the Athletic Association represent the class in all matters connected with athletics, and help in carrying on the general work of the Association. The present Association was formed in 1907 for the purpose of increasing the efficiency of the governing body on athletics. Until then every member of the Institute had been able to become a member of the Athletic Association by the payment of a small fee, but as that system failed to carry on the work with any degree of dispatch, the interest dwindled until its abolition and reorganization. Under the new system, five men elected from each of the four classes, together with the captains and managers of all Institute teams, make up the Association and co-operate with the Advisory Council on Athletics. The hopes of the founders have to a large extent been realized, and the new association has proved less cumbersome and more efficient than the old.

Probably the most important of all undergraduate bodies at Technology is the Institute Committee. The two Freshmen elected to this committee hold a larger place in the field of Institute work than any of their classmates, excepting the President, the influence of the members having steadily increased with the growth of the power of the committee.

The plan for the Institute Committee was first devised by the Class of '93, with the object of furthering the interests of Technology, and forming a responsible body through which communications could be directly made between the students and the Faculty. Its purposes are very much the same to-day, and the membership has been increased so that it now represents fairly every branch of the undergraduate activities in the Institute. The Point System, management of the Union, and other phases of its work are taken up under a separate article, so that here it is only necessary to emphasize the fact that the Institute Committee offers a great opportunity to an incoming student for performing influential and altruistic work.

After the general election of officers in the early fall of the first year, no new men are appointed or elected for carrying on the class work, excepting the Dinner Committees and the Baseball Managers. The Dinner Committees generally consist of three men, who are appointed by the President to arrange Class Dinners on dates which are set by the Board of Directors. The Baseball Manager and Assistant Manager are appointed by the Board of Directors, and the names are brought up in class meeting for approval.

In the Sophomore year the class election takes place not later than the fourth Saturday of the term. The officers are the same as those of the Freshman year, and their duties are similar. The new officers take charge of their work one week after their election.

It falls to the lot of the Sophomores, rather than to the Freshmen, to make all the arrangements for "Tech Night" at the theatre. These preparations are conducted by a committee of three, which is appointed from the class by the President, and which is known as the

Theatre Committee. The work consists in taking a preliminary canvass of the class to find out how many men desire seats for the performance, then in making arrangements with the manager of some one of the better theatres, and in selling the seats among the students. The committee also usually succeeds in arranging special Technology and class innovations in the performance. The men on the committee are responsible for the behavior of the students at the theatre, and hence try to suppress anything which might lead to general disorder or injury to the furnishings. The expenses of the committee, such as decorations, etc., are paid out of the class treasury.

In March of the Sophomore year the class holds the election for the Technique Electoral Committee. This committee was first organized by the Class of 1891 for the purpose of electing the Technique Board, the idea being that such a committee would select a more responsible board than would be elected by a popular class election. The idea worked out so well that it has been followed by every class since. The Board of Directors prepare a ballot with the names of all the members of the class in alphabetical order, and mail one to each member. The twenty-five men on the ballot receiving the highest number of votes constitute the Electoral Committee.

At the first meeting of the committee, a Chairman and Secretary are elected, and a committee is appointed by the chair to frame a constitution. At the next meeting the constitution is brought up for adoption, and when it has been adopted, the main business of discussing and electing candidates for the fifteen places on the Technique Board is commenced. The officers of the board consist of four Editors, three Managers, Art Editor, Assistant Art Editors, two Statisticians, Athletic Editor, Society Editor. These men are selected from the class as a whole, and are

judged with regard to their ability to turn out a worthy *Technique*. Many of those on the Electoral Committee are elected to the board, but this happens only after the other members of the class have been carefully considered.

This "making" the Technique Board is regarded as one of the greatest honors that come to a man in the Institute, for the standing of past boards has been high. At the electoral meetings seldom more than three men are elected at a time, and the discussion of candidates is sometimes so searching that the meeting closes without resulting in an election. The meetings are held weekly through the latter part of April and May, and the Technique Board is seldom completed much before the end of the term.

After the fall election of officers in the Junior year, there are no further elections until the early part of December, when the President calls for nominations for members of the Junior Prom Committee. These nomination papers require the usual ten endorsers. In addition to the President, who is a member *ex-officio*, there should be four on the committee, except when there is a tie for fourth place, in which case the men tying may both or all make the committee. The balloting returns are usually in by the middle of December, and the committee begins to make preliminary arrangements for the Prom by the middle of January, the meetings becoming frequent in the few weeks preceding Junior Week when the Prom takes place.

The political year of the Seniors opens with the annual election of officers. This election is for several reasons the most important of the four years. The President, besides having the regular duties of his office, is *ex-officio* member and president of the Institute Committee, also *ex-officio* a member of the Class Day Committee, introducing the First Marshal at the Class Day exercises.

The Secretary is generally the first graduate secretary, and if possible should reside in or near Boston. There is more honor than responsibility connected with the other offices.

The next election of importance is that of the Senior Portfolio Committee, and takes place early in December. Five men are elected to this committee, and it is their duty to publish the portfolio of the class in time for the Senior Week festivities. The method of nominating is similar to that of other offices and committees.

The Class Day Committee is the last and most important committee to be elected. The election is held about the middle of March. Twenty-five men are elected, making, with the President of the class, twenty-six on the committee. A ballot containing the names of all the members of the class is issued, and the twenty-five receiving the highest number of votes are elected. The duty of the committee is to have full charge of the Class Day exercises and Senior Week festivities. It elects a Statistician and Historian, Class Prophet, Presentation Orator, Gift Orator, and Class Day Orator. In 1909 the Class Day Committee decided not to elect a Class Day Orator.

By sub-committees of from one to three men, the committee takes charge of the following events: Class Dinner, Concert of the Musical Clubs, Baccalaureate Sermon, Class Day Exercises, Class Spread, Senior Dance, and any other matters which may seem advisable.

The officers of the committee are First, Second, and Third Marshals, a Secretary, and a Treasurer.

The election of the marshals is by popular vote; the offices are given to the three men who have done the most for their class and are the most popular. The First Marshal is Chairman of the Committee, presides at all meetings, appoints all sub-committees, and after being

presented by the Class President on Class Day, has full charge of the Class Day Exercises. For these reasons the man holding this position must not only be popular and be an unselfish worker for the class, but must have the ability to carry out the duties of his office. The offices of Second and Third Marshal are purely honorary and do not necessarily carry with them any great responsibility.

The Secretary has the usual duties of that office; the Treasurer has charge of all finances of the class connected with the Senior Week festivities and the Class Gift, and his office is an important one.

There have been two methods of electing the marshals. By one the three men receiving the highest number of votes of any making the Committee are First, Second, and Third Marshals respectively. This method, however, does not always elect the man most capable of holding the position of First Marshal. With the classes of 1907, 1908, and 1909, after the committee has been elected, a ballot is issued containing the names of all members of the committee, except the class president, and three names are voted upon by the class. The one receiving the highest number of votes is then First Marshal, the next highest Second, and next Third.

CONSTITUTION OF THE CLASS OF 1912 OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

ARTICLE I. NAME

SECTION 1. This organization shall be known as the "Class of 1912 of the Massachusetts Institute of Technology."

ARTICLE 2. MEMBERSHIP

SECTION 1. All persons taking a majority of hours with this class shall be eligible to membership.

SECT. 2. Any member of this class failing to pay his dues before date of election of permanent officers shall forfeit his membership and his right to vote; and shall be reinstated only on the payment of the same.

SECT. 3. Any member, who shall for any reason after becoming a member of this class take a majority of his hours in another class, shall thereby forfeit his membership to this class.

ARTICLE 3. OFFICERS

SECTION 1. The officers of this class shall consist of a President, Vice-President, Secretary, and Treasurer; two Directors and two representatives to the Institute Committee; all of whom shall constitute a Board of Directors for the class. These officers shall be elected for a term of one year.

ARTICLE 4. DUTIES

SECTION 1. The President shall preside over all meetings of the class and the Board of Directors, and shall be a member of all committees, *ex-officio*.

SECT. 2. The Vice-President shall assume the duties of the President in case of the latter's disability, absence, or resignation.

SECT. 3. The Secretary shall perform the regular duties pertaining to his office.

SECT. 4. The Treasurer shall perform the regular duties pertaining to his office.

SECT. 5. The Board of Directors shall have charge of the social and general affairs of the class, shall have power to make contracts, pay bills, and shall have full control of the disposition of class funds and properties, and may enact any measures deemed fit for the benefit of the class.

SECT. 6. No bills or debts shall be paid or assumed without the sanction of the Board of Directors.

SECT. 7. The Board of Directors shall meet once a month, and at any other time that the President may convene it.

ARTICLE 5. DUES

SECTION 1. The annual dues shall be \$1.00 (one dollar), and shall be payable before the election of permanent officers.

SECT. 2. A two-thirds' vote of the members present at the class meetings shall be necessary to levy an assessment.

ARTICLE 6. MEETINGS

SECTION 1. Class meetings may be called by the Board of Directors, the President, or upon written request to the President, signed by 30 (thirty) members of the class.

SECT. 2. All notices of meetings shall be posted on regular bulletin boards assigned to the class, at least 3 (three) days in advance; except those to consider amendment, which shall be posted at least a week in advance.

SECT. 3. In all meetings those present shall constitute a quorum.

ARTICLE 7

SECTION 1. After the adoption of this Constitution, the President pro tem shall name a committee on election, consisting of 4 (four) members of the class, who are not nominees for any office. The meeting will then adjourn and this committee on election will arrange for the nomination and election of officers in the following manner:

SECT. 2. Nominations to office shall be made to the committee on elections within four days, and, after the Freshman year, 7 (seven) days after the committee's appointment. Each nomination to be signed by ten or more members of the class. The committee shall receive no nominations after 4 P.M. on the day that the nominations close. In case less than 3 (three) nominations to each office are received, the committee shall nominate candidates to make up this number.

SECT. 3. The committee shall then send printed ballots to each member of the class to be filled out and returned. Four days after the sending of these ballots, the polls shall be closed, the committee shall count the ballots returned, and post the results on the bulletin boards.

SECT. 4. The candidates receiving a plurality of votes cast shall be declared elected.

SECT. 5. In case of a tie vote, the names of the candidates concerned shall be resubmitted to the class for election.

SECT. 6. Ballots shall be retained one month subject to recount, and then destroyed.

SECT. 7. A demand for recount must be signed by 30 (thirty) or more members of the class.

SECT. 8. In succeeding years, each President shall name the committee on elections one week before the expiration of his term, and the committee shall act in the manner prescribed above.

ARTICLE 8

SECTION 1. A special meeting shall be necessary to consider amendments and the amendments must be stated in the call for meeting.

SECT. 2. A two-thirds' vote of those present shall be necessary to amend this Constitution.

ARTICLE 9

SECTION 1. This Constitution shall go into effect immediately upon its adoption. A three-fourths' vote of those present shall be necessary for adoption.

The Tech Show

IN the fall of 1898 the Athletic Association was in need of money, and a few prominent students suggested that a minstrel show be given in Huntington Hall of Rogers Building, and admission charged, the proceeds to be given to the Association. The plan grew; it outgrew Huntington Hall, and on May 12, 1899, there appeared at Hollis Street Theatre the first Tech Show. Boston composers wrote the music, the musical clubs aided, society leaders lent their patronage, and a few hundred dollars was cleared to keep up the struggle of athletics.

The next year it was decided to produce a comic opera, and "The Medicine Man," written by a couple of students, was given. The play was pretty successful, but added more to the reputation than to the wealth of the Show. In 1901 it was necessary to go outside the Institute, and Gilbert and Sullivan's "The Grand Duke" was presented for the first time in this country. The year following, Mrs. Edmonson Walker wrote the words and music for a strictly Technology play entitled "Applied Mechanics." It dealt with Tech students and co-eds, and was the most successful production up to that time, the profits amounting to \$500.

In 1903 "The Scientific King" was given. It was a comic opera about Technology life and was written by Tech students. It did what the others had failed to do, — it aroused outside interest in the Show. The reputation which it has had since was started, and \$1000 was cleared for athletics.

"Simon Pure Brass" seems to be generally conceded as the best show artistically that Tech has ever given. The music was particularly good, and some of it was afterward printed in sheet form. Following this success, the "Chemical Maid," the "Freshman," "William, Willie and Bill," and "Over the Garden Wall" added to the fame of the Show, which was now recognized as the leading social activity of the Institute, and the chief support of athletics. The eleventh show, "That Pill Grimm," was perhaps the most successful, being presented five times and clearing about \$1250.

If to-day you ask an Institute man what the Tech Show is he will say, "It is the best college show in the country." Ask a Boston man who has seen a show, and he will say, "The best amateur show given in Boston, — a show with

music as good and dialogues as amusing as you will find in many a musical comedy of the professional stage."

The Tech Show is to-day a musical comedy full of local hits on the Faculty of the Institute and full of the color of Institute life. Two or more performances are given at one of the leading theatres of Boston, and usually a trip to Northampton or Providence, and a trip to Malden are included in the bookings.

The object of the Show is, first, "To promote good fellowship and student relations at the Institute and to bring together on a democratic basis men of all classes." Its second, — and by no means the lesser object, — is to raise funds for the benefit of Institute athletics.

With the exception of the professional stage director, the musical director, and the orchestra, the whole production is the work of Tech students. Tech men write the book, the lyrics, and the music. Tech men take the principal parts, and serve as chorus men and chorus girls. Tech men manage the production, make the bookings, and handle the money.

The first call for the cast is usually in the first week of the second term. For "That Pill Grimm" there were one hundred and fifty candidates for the sixty odd places. The men are picked by the directors for their voices, their looks, and their ability to dance gracefully. Rehearsals then begin. Principals are schooled in their parts, and the chorus is drilled in the songs and dances. Rehearsals are held three times a week for principals and three times a week for the chorus, till the Show is given in the middle of April.

The watchword of the Show has always been "The best man for the place." In accordance with this rule, all the places in the cast and on the management are filled by competition. Lyrics and music are selected by

competition, the stage department acting as judges. The man submitting a book for the Show hands it in with only a number attached, so that personal considerations shall have no chance to interfere with the choice of the best book among those offered. The management selects the book, and the author is announced at the annual Show Dinner, which is given at the Tech Union in the fall with the object of arousing interest in the coming show.

The management of the Show is divided into three departments, — Stage, Business, and Advertising, each having its department manager and assistants.

The General Manager is the executive head of the Show and is preferably a Senior with three years' experience in the Show. He is responsible for the policy of the Show, the method of conducting business, and the work of his subordinates. He approves all contracts before they are signed, and all bills and expense accounts before they are paid. He requires monthly detailed reports from the department managers which, if approved by him, are placed on file.

The Business Manager is personally responsible for all funds of the Show, and has in his charge all the fiscal affairs. He is preferably a Junior with two years' experience in the Show. He has three assistants, preferably one Sophomore with one year's experience and two Freshmen. With his assistants he solicits advertisements for the program and arranges for its publication.

The Stage Manager is preferably a Junior with two years' experience in his department. He has two assistants, one preferably a Sophomore of one year's experience, and one preferably a Freshman. The Stage Manager is responsible for a finished and successful production of the Show. He has complete control of the rehearsals and production, and of the cast.

The Advertising Manager is preferably a Junior with two years' experience in the Show, and he has two assistants qualified as in the case of the Stage Manager's assistants. The Advertising Manager has charge of the advertising. He advertises the Show in Boston by posters, newspaper stories, and advertisements, and is responsible for the advertising in towns where the Show is produced.

The idea of the class regulation of the management is this. A man enters one department in his Freshman year. In his Junior year, if he has proved worthy, he is fit for the position of manager of that department. The General Manager is chosen from the department managers. This yearly promotion assures a management sufficiently experienced to handle the affairs of the Show.

The books of the Show are kept by an experienced bookkeeper and the stenographer at the Union takes all letters. Thus the management is relieved of much of the routine work.

An Advisory Committee, consisting of Mr. Rand, Bursar of the Institute, Mr. M. L. Emerson, General Manager of the 1904 Show, and the President of the Senior Class, audits the books twice yearly, and approves appointments and promotions in the management.

The Tech Show to-day is a great factor in the life of the Institute. The interest in it is such that seats for the performances must be assigned by allotment. For the last few years the Boston houses have been sold out when the curtain went up. The finish and quality of the performance is now very high indeed, and, with the systematic methods of handling business which the management has lately adopted, it is well worth the while of students to go into the Show for the good times and the training of the chorus, or for the business training of the management.

Technique

TECHNIQUE, the Institute Year-Book, is published by the Junior Class and is issued at the beginning of Junior Week. It is named after the publishing class.

The first volume of TECHNIQUE was a pamphlet of some hundred and seventy pages, published in 1885, and called "Technique, '87." From this it has grown until now it has reached as high a standard of excellence as it is possible to attain in the time during which it must be prepared. For a number of years it has been a neatly bound, well arranged book of some four hundred pages. A standard size has been adopted, and since arrangement and material have been practically the same in all the later books, the chief points of rivalry have been artistic finish and the introduction of new departments. The book is issued in Junior Week, and the "rush" which attends the distribution of the first copies is one of the events of the week. The first five men who succeed in struggling to the window where the copies are given out, and in presenting their tickets, have the money paid for the ticket refunded; the first twenty-five men receive copies signed by the President of the Institute.

The Technique Board is elected each spring by the Technique Electoral Committee. This committee is composed of twenty-five men elected from the Sophomore class by popular vote. The committee in making appointments to the board is supposed to consider every man in the class on his merits, without reference to his popularity with members of the class.

The Board is composed of an Editor-in-Chief; Athletic, Society, Grind, Class History, and Faculty editors; two Statisticians; a Business Manager and several assistants; and an Art Editor and assistants.

The Editor-in-Chief acts as chairman of all meetings. He should see that all work assigned to the different members of the Board is done on time. He should be a fellow with original ideas and should be enthusiastic about the work. The Class History Editor, as his title indicates, has charge of the department of class histories. His duty is to obtain four original class histories by competition. The Grind Editor is in charge of perhaps the most important part of the annual, for if his department does not possess originality and a clever vein of humor, general opinion will taboo the whole book. The Faculty Editor must attend to the Faculty department, and is also expected to cooperate with other departments. The Athletic Editor must compile the results of all meets and games, and has supervision of the athletic department.

The two statisticians make out a list of questions, which is sent to every member in the class, and compile the results for publication. The Society Editor collects lists of members of all clubs, societies, and fraternities. The Treasurer must have charge of all funds and oversight of the sale of all books.

The Business Manager and his assistants have the responsibility of financing the book; and upon their work depends the amount of money which can be spent upon the publication. They must obtain advertisements and must sell the book. Several of the assistants are picked by competition. The general appearance of the book rests almost entirely with the Art Editor and his staff. Since in this respect the book can vary greatly from year to year, the comparison of one book with another is in great part based upon the art work. Positions on this staff are open to competition.

TECHNIQUE, although published by Juniors, depends a great deal upon literary and artistic contributions from

the members of all classes. In fact, the success of the Grind, Class History, and Art departments requires the co-operation of a large majority who are not on the Board, or even in the Junior class. It is also particularly advantageous for members of the Freshman and Sophomore classes to contribute work, in order that their electoral committees may have something definite by which to judge the capabilities of candidates for the Board.

The honor of being on the Technique Board is great. The experience, too, is worth while, and the members of the Board receive valuable knowledge of the printing and the engraving business.

All issues of *TECHNIQUE* are kept on file at the Union and may be taken from the case by obtaining the key of the case at the Cage. These books, especially some of the older ones, are quite valuable and care should be taken not to mutilate them.

The price of *TECHNIQUE* is \$2.00 per copy.

The Tech

AFTER several unsuccessful attempts had been made to establish and maintain a college paper at the Institute, *The Tech* finally appeared in November, 1881, being issued once a fortnight. It was in the form of a pamphlet, and contained not only Institute news, but also verse, stories, and occasionally articles of a scientific nature. Until 1889, the paper was managed by a board of seven directors who were elected from the various classes. In 1892, *The Tech* became a weekly; in 1905 it was issued three times a week; and this fall (1909) it becomes a daily. Important events in Institute affairs are often marked by the appearance of "extras."

The issue is now journalistic in form, consisting of four pages of four columns each. In addition to the news articles, the issue contains editorials, communications, current events, news from other colleges, notices, and a calendar of coming events. Cuts often enliven the pages and advertisements help to support the paper.

The management of the paper is left entirely in the hands of the staffs. The Editorial Staff consists, at present, of editor-in-chief, managing editor, athletic, societies, Institute, and exchange editors. These have the duties generally associated with their offices. Each issue has also a special staff of its own, consisting of an associate editor and a news staff. The associate editor is the managing editor of the issue assigning "write-ups" to members of the news staff, preparing the "dummy," managing the work at the printer's, proof-reading, etc.

The business staff of The Tech consists of a business manager and an advertising staff. They are in charge of the finances, procuring advertisements and attending to all bills. One member of the advertising staff is assigned to each issue to obtain and to arrange the advertisements.

The circulation staff consists of a circulation manager and circulation staff, whose duty it is to see that each issue is properly distributed and that copies are sent to subscribers.

The board of The Tech is made up each year almost entirely of members of the two lower classes. The Juniors are often obliged by the Point System to give up their work on The Tech on account of election to positions on Technique. Thus there is always a splendid opportunity for new men. No previous experience is necessary, the main requirement being reliability. The experience to be gained in the literary department is not

only along literary lines, but also in the practical experience of planning and running a paper. The executive work of management or assistance at the printer's is another valuable characteristic of the work, which comes sooner or later to each candidate. The business and circulation staffs also offer excellent business practice. One of the most valuable points of the work upon The Tech is the acquaintance that it gives with Institute men and Institute affairs. The Tech need not take too much of the candidate's time, since he will be called upon to work for the one issue chosen to suit his convenience. Information will be given at the office in Engineering C, just outside of the Union.

The Senior Portfolio

THE SENIOR PORTFOLIO is published during the Senior year by a committee of five Seniors. It contains the pictures and histories of all Seniors, and of those who have at any time been connected with the class. Pictures of the President, officers of the Faculty, heads of Courses, class teams and committees, and of the buildings are often added. The book is neatly bound in leather, and is generally issued just before Senior Week at a cost of \$6.00.

Valuable experience in methods of printing, engraving, and binding is obtained by those who are on the committee.

Calendar

September. The Institute opens the first Wednesday after September 25. Registration material is ready in Rogers Building about a

Registration. week before the opening of the term (see article on Registration). New men especially should be on hand the

first of the week so as to be settled and to have registration complete by Wednesday at 10 o'clock. Professors and instructors can be found in the General Library on the first two days of the week and are always ready to answer questions and give advice. Also, there is always a large number of upper-classmen on hand who are willing to answer questions and to help in filling out registration material. Don't be afraid to ask questions of anybody. The President addresses the class, on the first day of the term, in Huntington Hall, and shortly after-

Organization of Freshman Class. ward the Juniors organize the Freshman Class. It is very important that all Freshmen be present at both of these meetings. At the latter temporary officers are elected, and the success of Field Day (see article on Athletics and Class Organization) is largely due to their efforts.

October. On the Friday night of the week in which **Y. M. C. A.** the term opens, the Y. M. C. A. holds **Reception.** its reception to new men at the Technology Union. Among the speakers are the Dean and the heads of the various student activities. A great number of upper-classmen, especially Juniors, are present; refreshments are served, and the evening is spent in making acquaintances and in getting the first glimpse of Institute life.

The first of the regular Friday night entertainments **The Union** is held at the Union on the following **Friday Night** Friday. These entertainments, which consist usually of talks by prominent men, **Entertainments.** begin at eight o'clock, lasting about an hour, and are followed by light refreshments at the small cost of ten cents. This night has been chosen as the one on which the majority of students could attend without interfering with the preparation of Institute work. No games or meets at the Gymnasium and no class or club dinners are held on

this evening, so that the success of these meetings is not interfered with by other activities. (See article on The Union.)

First Five Weeks Examinations. **November.** The end of the first five weeks usually comes the first week of November. Examinations lasting about one hour are given in all subjects to the Freshmen and Sophomores. These are all over, however, before Field Day, which comes early in this month, and is held on a Friday afternoon, all exercises at the Institute being suspended at twelve o'clock. In the evening the two lower classes celebrate "Tech Night" at some theatre. (See article on Athletics.)

Thanksgiving Day. Thanksgiving Day is a holiday, but only the one day is given.

Second Five Weeks Examinations. **December.** The second five weeks examinations are always completed before the week preceding Christmas vacation. A Christmas recess of one week is given, and the exact date is determined by vote of the Faculty a few weeks beforehand. For those who are unable to go home at this time, the Entertainment Committee gives an entertainment at the Union on Christmas Eve. Small presents are given to all those who attend, refreshments are served, and a very pleasant evening is spent.

January. As New Year's Day is not a holiday in New Year's Day. New England, exercises go on as usual. The mid-year examinations for Seniors and Juniors begin about the twentieth of the month, while those for Sophomores and Freshmen begin some days later and last from

Mid-year Examinations.

five to six days. Schedules of examinations are given out

Mid-year about a week beforehand. After the last
Vacation . examination, there is a vacation of ten days before the second term begins.

February. The second term begins on the first
Second Tuesday after February 4. Material for regis-
Term. tration is often ready before or during the mid-year vacation. It is advisable to procure this as soon as possible and to register, even before reports on examinations are received. Reports are mailed to students the Saturday before the opening of the second term.

Washington's Washington's Birthday is a holiday,
Birthday. and all Institute buildings are closed.

March. The first five weeks examinations of the
Five Weeks second term come about the middle of
Examinations. the month. First term deficiencies have to be made up before the end of the month.

April. The second five weeks examinations are over just before the nineteenth.

Junior Week comes the week of the nineteenth. Three days and a half are given for it by
Junior Week. the Faculty, making, with Saturday and Sunday, a vacation of at least five days. As the name signifies, the events of the week are more particularly Junior affairs, and in most part are run by the Junior Class. The "Technique Rush" (see article on Technique) usually starts off the week, and for the last few years Technique has come out at 12.15 the Saturday before the nineteenth. The Musical Clubs give their concert (see article on Musical Clubs) on one of the evenings of the week, and this is followed by a dance. Both are well attended by members of all classes, and have become very popular. The Tech Show gives its performance

on different afternoons of the week (see article on Tech Show) and the house is always crowded. Several fraternities give teas, at which many friends are present, and a few have house parties. By far the biggest event of the week is the Junior Prom. This is held at the Somerset, and the large ballroom at this hotel is always taxed to its limit of five hundred. The Prom is attended for the most part by the Juniors and Seniors. Sophomores support it to some extent, but Freshmen are generally conspicuous by their absence.

May. During the month there are generally two or

Dual Meets. three dual meets with the track teams of other New England colleges. The New England Intercollegiates are held about the middle of the month at Tech Field, and on the following week comes the Intercollegiates at the Stadium, Cambridge.

Final examinations take up the last two weeks of May, the examinations for the under-classmen starting as usual some days later than those for upper-classmen.

**Final
Examinations.**

June. The Senior examinations are over on Tuesday, one week before graduation. The Senior

**Senior
Dinner.** Dinner, generally held at the American House on the Thursday evening before

Commencement, starts the festivities of Senior Week. As this is the last class dinner, every one is present and the dinner is a great success. Notices of gradu-

**Notices of
Graduation.** ation are given out on this evening. Later in the evening the class marches up to

Rogers Building, when the notices are given out. On Saturday is the concert of the Musical Clubs, which is

Senior Dance. usually not followed by a dance, the Senior Dance coming the following Monday. The

**Baccalaureate
Sermon.** Baccalaureate Sermon has always been held on Sunday at 4.00 P.M. in Trinity Church.

The Class Day exercises (see article on Class Organization) are held in Huntington Hall on Monday afternoon, and these are followed by the Spread on the lawn between the Rogers and the Walker Buildings. Tuesday morning the Seniors visit the different professors in their offices, and rehearse for the graduation exercises, which come in the afternoon at 2.30. These are followed by the reception of the President to the Seniors in the General Library.

Tech Night at the Pops is usually held on Tuesday evening of graduation week. The event has been increasingly popular, till for the last few years tickets have been on sale only for Tech men for themselves and their friends, — floor tickets for the men and balcony tickets for their friends.

On this evening many of the alumni classes have class dinners, and go to Symphony Hall in a body. Seats on the floor of the hall are assigned by classes, with the graduating class at the front of the hall, then the oldest of the alumni classes, with the youngest classes at the back of the hall.

As each class comes into the corridor, an usher brings its class banner, and the class in a body is escorted to its place in the hall amid cheering by themselves and the other classes. Cheering continues throughout the evening, especially between the numbers of the program. After the concert, the classes all march down Huntington Avenue and form in front of Rogers Building, where there is more cheering, the front of the building sometimes being illuminated with red fire or electric lights.

ATHLETICS

EMBOSSSED on a tablet over the gate which gives entrance to the Institute Athletic Field the following words may be read:

“Not the Quarry, but the Chase,
Not the Laurel, but the Race,
Not the Hazard, but the Play,
Make me, Lord, Enjoy Alway.”

These words are truly typical of the athletic spirit which pervades Technology. There is a definite aim, not to develop a few individual stars, not to turn out a crack team solely by devoting all energies to a dozen or more first-class men, but rather to interest a large proportion of the student body in healthy, hearty, life-giving exercise in the time available for such work.

In 1902, 'Varsity football and baseball were abolished by vote of the student body. It was found that the conditions under which the Institute students work do not allow of the necessary coöperation for the development of efficient team-work, and that too few men were being benefited by these sports. This may be readily understood when it is noted that the regular Institute exercises extend until four o'clock in the afternoon, and that the daily work is too important to admit of a team's making any out-of-town trips.

A new policy was inaugurated, — that of arousing interest in track work, where individual effort is the greatest factor of success; in gymnasium work, which is essential to student life in a city, and particularly in interclass competition. The policy has in seven years produced most

gratifying results, and with it has grown a strong interest in minor athletics, which are well supported.

All branches of athletics at Technology are now controlled by a student athletic association composed of five representatives from each class, the captain and managers of the several teams, and by an Advisory Council made up of four prominent graduates and three undergraduates. With these two committees rests entire jurisdiction as to awards of letters and numerals, as to the management of the teams, as to the financing of and all matters pertaining to athletics. The Faculty have no ruling barring students from competition because of deficiency in studies. It is felt and understood by all that a student's primary object at the Institute is to graduate, and each man is left to be the judge of his own capabilities.

One of the biggest days on the Technology calendar is the Annual Field Day, held early in November, between the Sophomores and Freshmen. The first Field Day was held November 19, 1901, as a substitute for the old Cane Rush. The Field Day games, however, are not the creation of any one year, but are the evolution of twenty years' experience, having been developed from a desire to settle at the beginning of the college year the natural rivalry between the two lower classes.

The first contest between the Freshmen and the Sophomores at Technology was a football game between the classes of 1889 and 1890 in November, 1886. The game was hotly contested, and the Freshmen finally won by a score of 4 to 0. As was natural, the Freshmen were greatly excited over the victory, and gave vent to their feelings in such a manner that the Sophomores, maddened by defeat, rushed upon them, and a general scrimmage followed. A cane was held aloft as a challenge and a hard fight of twenty minutes' duration followed. The Sopho-

mores captured the stick, and fortunately no one was injured.

From this time until 1900 the football game and a cane rush between the lower classes was an established event upon the college calendar. Each year the cane rush became more furious, and as early as 1891 it was found necessary to frame a set of rules to govern the contest. Even then numerous minor casualties occurred; but in 1900, in the scrimmage after the football game, a member of the Freshman class, H. C. Moore, was fatally injured. On account of this accident, the cane rush was abolished.

In the following year, 1901, the new plan of regularly ordered Field Day games, as developed by the Advisory Council on Athletics and Dr. Henry S. Pritchett, then President of the Institute, was tried with such great success that it has been continued from that time until this day. The plan provided for a football game, a relay race, and a tug-of-war with Freshmen and Sophomores as the opposing teams. To stimulate rivalry, a beautiful silver championship cup was offered by an alumnus, Samuel Cabot. On it are a Technology Seal and fifty panels. An inscription around the base reads: "He Who Shuns the Dust and Heat of the Arena Shall Not Enjoy the Cool Shade of the Olive Branch of Victory."

Each year, in one of the panels, are placed the numerals of the winning class. Nine of the panels are now (1909) filled, and it is a singular fact that only two classes have failed to get their numerals upon the cup. These are 1904 and 1911, the first and the last of the Sophomore classes which have competed.

The candidates for these class teams are called out immediately upon the opening of the Fall term. Practice for the football and the relay teams is held at the Tech

Field in Brookline, and for the tug-of-war teams at the Gymnasium on Garrison Street.

Each football team plans a schedule of games with surrounding preparatory schools preliminary to the championship game on Field Day. Practice is held daily from 4.30 to 6.00 under paid coaches. The halves of the Field Day game are of twenty minutes each. The members of each team and six substitutes receive their numerals. To the winning team four points are awarded toward the Field Day score. In case of a tie, the points are divided.

The relay teams are composed of twelve men each. Each man runs 220 yards, carrying a small flag which he passes to his team-mate. The record for the complete distance, $1\frac{1}{2}$ miles, is 5 minutes, giving an average of 25 seconds per man. It is at present (1909) shared by the classes of 1908 and 1910. Numerals are awarded to the members and two substitutes of the winning team only, and three points are given this team toward the total score. It is an interesting fact to note that, as far as is known, this is the only running relay race in which an article is actually carried by the contestants to be successfully passed from one to the other. In the so-called relay races at the Boston Athletic Association games, and at similar races in New York, and at the Pennsylvania Relay Carnivals, in fact, in races throughout the country, the runners are supposed to touch hands or some part of the body.

Twenty-five men are needed for each tug-of-war team, and the contest is one of the most interesting on the program. Two out of three pulls settle the contest, and in this event there is an almost unbroken chain of Freshman victories. The sport is not so simple as it at first appears, and many a time the class with the better machine work has pulled a heavier team off its feet. To the

twenty-five men of the winning team and two substitutes class numerals are given, and two points are allowed toward the total score.

The class with largest total score resulting from the three contests earns the right to have its numerals engraved on a panel of the Field Day cup. Moreover, unless a class has won a Field Day, none of its members are allowed to smoke a class pipe during their Freshman or Sophomore years.

On the evening of Field Day the members of all the teams, together with all their supporters from the two lower classes and large numbers of upper-classmen, attend some theatre in a body. This event, known as "Tech Night," is planned out by theatre committees weeks in advance. The house is, as a rule, almost entirely sold out to Tech men; and the theatrical management decorates the theatre in red and gray and introduces local hits and special Tech songs into the play. M. I. T. yells, class yells, and Tech songs fill up the time between the acts, and a good-natured volley of confetti and streamers is maintained between the classes and often with the actors. The Sophomores have seats in the orchestra, the Freshmen in the balconies, and the boxes are given over to the teams. Altogether this evening is one well spent and not soon forgotten.

After Field Day all rivalry between the lower classes is at an end, and all the contestants are invited to a Field Day Dinner held at the Union. At this dinner the big silver cup is passed from hand to hand, never touching the table, and each man before he drinks gives his name and the town or city from which he comes.

Technology's biggest 'Varsity team is the track team, and for many years a high standard has been maintained. Technology is a member of the New England Intercol-

legiate Athletic Association, and has recently been admitted to the Intercollegiate Association of Amateur Athletics of America.

All outdoor work is carried on at the Tech Field, situated in Brookline, about a twenty-minute car ride from the Institute. The Tech Field was bought by the Institute in 1902 and was made over into an athletic field in 1904. The spectators' accommodations, the dressing-room, the baths, and the fence about the field were provided through the generosity of Mr. George Wigglesworth (Harvard, 1874), who, as treasurer of the Institute and member of the Corporation, has always taken a deep interest in the welfare of the students.

The field has a quarter-mile track, with a 100-yard and a 220-yard straightaway; broad jumping, high jumping, and pole vaulting pits; suitable places for hammer and discus throwing and shot putting; space for football and baseball games; two tennis courts; a locker room and dressing quarters with baths; and two grandstands. The track has the reputation of being one of the fastest in New England, and the annual Intercollegiate Track and Field Meets of the New England Intercollegiate Athletic Association are held here.

Under the auspices of the M. I. T. A. A. three interclass meets are held annually: the Fall Handicap (preceding Field Day), the Indoor Meet (a scratch meet held in the Tech Gymnasium during January), and the Spring Meet (an outdoor scratch meet held in April). Besides these are usually one or two dual meets and the New England Intercollegiates.

Major Briggs, 1881, has presented a cup upon which the class which makes the highest total number of points in the two scratch interclass meets has its numerals engraved. Also, three cups are annually presented in the

Spring Meet to the winners of the mile, the quarter-mile, and the 120-yard hurdles events. These cups, which are the gifts of alumni who made good in these events, J. L. Batchelder, Jr., 1890, Dr. J. A. Rockwell, 1896, and Benjamin Hurd, 1896, are duplicated annually. The usual prizes in all other events at the Fall and Spring Meets are M. I. T. A. A. medals, and at the Winter Meet suitable cups.

Technology now holds three track records in the New England Intercollegiates, the 220-yard dash, the half-mile and the two-mile runs. For several years Technology has finished in fourth place or better in these meets. A list of the Institute records is published at the end of this article.

In connection with the track team and under the same management are relay and cross-country teams. A relay team is entered annually in the Boston Athletic Association Meet, and for two years this team has made the fastest time of any team entered. The 1908 Technology team holds the track record for the Lawrence Light Guard Meet, and the 1909 team now holds the Intercollegiate record of America. This latter feat was accomplished in competition, on February 22, 1909, against Wesleyan at Troy, N. Y., when the team was within 2-5 of a second of the world's record. A relay team is sent annually to the Pennsylvania Relay Carnival, and in three years the Institute has won two first places and one third.

The training for cross-country work consists in a great part of weekly Hare and Hound runs. The team annually competes with Harvard and has won three out of five races over a $4\frac{1}{2}$ -mile course. Technology has been recently admitted to the Intercollegiate Cross-Country Association, and at Princeton last fall was second to Cornell over eight other colleges. Since, however, Tech

was not a member of the Association at the time, her points did not count on the official score. Many students take the Hare and Hounds runs from pure enjoyment of the sport, with no intention of trying for the team, and find them a most profitable form of exercise.

All track work since the fall of 1907 has been under the direction of Coach Frank M. Kanaly. Mr. Kanaly has an enviable record as an amateur and professional athlete, and it is owing in large measure to his efforts that track athletics at the Institute are on their present plane.

A basket-ball team is maintained at Technology, and a schedule of from sixteen to twenty games is played with other colleges. Several trips are taken, including one of a week's duration to New York during the mid-year vacation. The 1909 team won a majority of its games, defeating Dartmouth, Harvard, Williams, and other colleges.

The ice hockey team has each year been more and more a credit to the college, and recently some fast combinations have been turned out. As large a schedule as the ice permits is played each year, and a trip is taken in January.

A tennis team is entered in the N. E. I. L. T. A. meets each year, and two championships have resulted in recent years. Technology has at present six points won in competition for the New England Intercollegiate cup; eight points being necessary to win the cup. Annual Fall and Spring tournaments are conducted at the Institute, and usually there is a dual meet with some college.

Although fencing has been poorly supported, the 1909 Institute team made a very creditable showing. It went through a schedule of eight meets undefeated until the Intercollegiates were reached. The team passed the preliminaries here and took fourth place in the finals. On

account of the small number of men interested in fencing, as well as by reason of the poor support which was given the team, it was deemed advisable in the spring of 1909 to drop the sport. The prevailing sentiment was that it was better to end a sport at the close of a successful season, rather than to wait until it should die a natural death through reverses and ever-weakening enthusiasm.

Freshman and Sophomore class teams in baseball and basket-ball play a schedule of games with other schools and a series of games for the class championships. Also a Freshman and Sophomore Cross-Country race is held each spring, for a class cup known as the Cross-Country Cup. Numerals are awarded the winning teams.

Golf, rifle, and gymnasium teams complete the list of Technology athletics. The latter two are not under athletic control.

The Gymnasium is a separate building at the foot of Garrison Street. It contains lockers and showers, and is well equipped with apparatus. Around the floor is a nineteen-lap running-track with raised corners.

All first-year students take a course in physical training. At the beginning of the year five lectures on the relation of exercise to health are given. Later each student reports at the Gymnasium and takes a physical examination. After Field Day, or about the middle of November, gymnasium classes commence. Each section has two hours a week. The work ends in April, and a second examination is given to each student.

Bronze medals, known as the Cabot Medals for improvement in Physical Training, are awarded to the five or six men showing the greatest physical improvement for the year.

A Freshman may substitute track work for physical training by reporting to the Athletic Coach three times

a week. During the fall and spring, the track work is done at the Field, but during the winter months it is done in the Gymnasium. No track work is required during December.

A medical director is provided by the Faculty, and he may be consulted, by any student free of charge, on two afternoons of the week.

A conservative estimate would seem to show that, under the present system of athletics at Technology about one-fourth of the student body is interested in some form of athletics, exclusive of the compulsory gymnasium work in the first year.

Every man competing in Field or Track Sports, in Cross-Country runs, or in Relay races, undergoes a thorough medical examination before each competition.

The managers of nearly all the teams are picked in open competition.

Season tickets to athletic games may be purchased for \$3.00. These admit the bearer to all home track meets, indoor and outdoor, except the N. E. I. A. A. Meeting; to Field Day; to all Basket-Ball games at the Technology Gymnasium; to all other athletic contests held at the Technology Gymnasium or Athletic Field under the direct auspices of the Advisory Council. Holders of season tickets will be given preference to reserved seats (not exceeding two) at Tech Field Day, at all track meets, and in the Tech sections at the B. A. A., N. E. I. A. A., and I. C. A. A. A. A. Meets.

Qualifications for Letters and Numerals

The following are entitled to "T's":

(1) Winners of points at the annual meet of the New England Intercollegiate Athletic Association.

(2) Winners of points at the annual meet of the Intercollegiate Amateur Athletic Association of America.

(3) Participants in the semi-final (either singles or doubles) in the annual tournament of the New England Intercollegiate Lawn Tennis Association.

(4) Winners (either singles or members of a team) in the annual tournament of the New England Intercollegiate Golf Association.

(5) Winners (either singles or members of a team) in the annual tournament of the Intercollegiate Fencing Association.

(6) Members of a winning team, or any man making fifteenth place or better at the annual run of the Intercollegiate Cross-Country Association.

The following are entitled to "aTa":

(1) Winners of first place in open class meetings.

(2) Winners of points in dual or triangular intercollegiate meetings.

(3) Members of the M. I. T. Relay Teams.

(4) Manager of the Track Team.

The following are entitled to "cTc":

(1) The four men making the fastest time in the annual open Cross-Country Race.

(2) Any man making seventh place or better in dual or triangular intercollegiate meetings previously designated by the Advisory Council.

The following are entitled to "lTt," "gTt," "fTt," respectively, for Lawn Tennis, Golf, and Fencing:

Winners in dual or triangular intercollegiate meetings previously designated by the Advisory Council.

"lTt" winners of singles and doubles in the M. I. T. Intramural championships.

The following are entitled to class numerals:

- (1) Winners of points in open class meetings.
- (2) Members of winning **Baseball Team and Manager** in the Spring series.
- (3) Participants on **Technology Field Day** as follows:
 - (a) Members of both Football Teams, including Managers.
 - (b) Members of the winning team in the Relay Race, including Manager.
 - (c) Members of the winning Tug-of-War Team, including Manager.

The Advisory Council may award "T's" in meetings or matches previously approved and designated by them:

- (1) To the Manager of the Track Team.
- (2) To the first man in a dual or first or second in a triangular intercollegiate meeting.
- (3) To winners of an Intercollegiate Relay Race.
- (4) To any man who makes fifth place or better in a dual Intercollegiate Cross-Country Race.

The Advisory Council may award other designations as follows:

- (1) "lTt" to the Manager of the Lawn Tennis Team.
- (2) "fTt" to the Manager of the Fencing Team.
- (3) "hTt" to members of a Hockey Team who participate in two-thirds or more of the games played in one season, and to the Manager.
- (4) "bTb" to the members of the Basket-Ball Team who participate in two-thirds or more of the games played in one season, and to the Manager.

Members of Basket-Ball and Hockey Teams are allowed to wear the insignia as a designation in games only.

No combination or addition of points to aggregate the equivalent of a higher class will be counted.

M. I. T. Records

100-yard dash	R. S. Franklin, '03	10 1-5 sec.
220-yard dash	C. W. Gram, '09	22 sec.
440-yard dash	J. A. Rockwell, '99	51 1-5 sec.
120-yard high hurdles	E. L. Ovington, '04	16 2-5 sec.
220-yard low hurdles	G. P. Burch, '99	25 4-5 sec.
880-yard run	H. S. Baker, '03	1 m. 59 sec.
1-mile run	H. S. Baker, '03	4 m. 30 3-5 sec.
2-mile run	S. M. Udale, '07	9 m. 52 4-5 sec.
Running high-jump	C. P. Heywood, '93	6 ft. 1-2 in.
Running broad-jump	A. W. Groovenor, '99	22 ft. 1 1-2 in.
Pole vault	W. D. Allen, '11	11 ft. 4 1-4 in.
Putting 16-pound shot	H. P. McDonald, '01	40 ft. 1-4 in.
Throwing 16-pound hammer	W. J. Knapp, '06	126 ft. 7 in.
Throwing the discus	L. G. Merrill, '05	110 ft. 2 1-2 in.

THE ALUMNI

ALL graduates of the Institute are regular members of the Alumni Association, and every non-graduate member of a class which has been graduated may become an associate member on election by the Executive Committee. Associate members have full privilege of voting, but are not eligible as administrative officers of the Association.

The affairs of the Association are directed by the Alumni Council, — the will of the Council being executed by the Executive Committee, which also attends to certain matters pertaining to the permanency of the Association.

The Alumni Council is a representative body chosen from the members of the Alumni Association to act in behalf of that body on all matters not otherwise delegated. It consists of the five latest living ex-presidents, ten members at large, a representative from each class, and a representative from each local alumni association. The Council meets from time to time to consider any matters pertaining to the general welfare of the Association, and to take action on such matters as may be brought to its attention by the officers of the Faculty or the Corporation.

It will thus be seen that the Association is so organized that it can act expeditiously through accredited representatives, most of whom live in the vicinity of Boston. This organization has been perfected recently, and it is expected that it will take up matters relating to the policy of the Institute when presented by the proper authorities,

and also act coöperatively with the undergraduates whenever its assistance is desired by them. The Advisory Council on athletics is now appointed by the Alumni Association.

There are twenty-seven local alumni associations, which are located in the following cities: Annapolis, Md.; Buffalo, N. Y.; Los Angeles, Cal.; Cincinnati, Ohio; Chicago, Ill.; Springfield, Mass.; Hartford, Conn.; Spokane, Wash.; Lawrence, Mass.; Minneapolis, Minn.; New Bedford, Mass.; New York City; Syracuse, N. Y.; Oakland, Cal.; Cleveland, Ohio; Portland, Ore.; Steelton, Pa.; Philadelphia, Pa.; Pittsburg, Pa.; Tacoma, Wash.; Providence, R. I.; Denver, Col.; New Orleans, La.; Burlington, Vt.; Washington, D. C.; Detroit, Mich. These associations are growing stronger each year and becoming more numerous. Ten years ago there were but four or five. All of the associations have annual meetings and many of them have regular monthly meetings, when all Tech men are welcome. Some of the associations arrange to have a Tech luncheon on some particular day each week, and most of them have a special meeting early in the fall to welcome the members of the graduating class located in their vicinity. The New York Association has a permanent home at 17 Gramercy Park. The Technology Club in Boston is not listed as an alumni association, being a social club. All former students of the Institute, as well as a limited number of undergraduates, are eligible to its membership. It is located at 83 Newbury Street.

The relations of the Alumni Association to the Faculty and the Corporation are extremely close, for a large number of the alumni are members of the Faculty and of the Corporation. Besides having alumni life members on the Corporation, the Alumni Association each year elects three

members to serve for a term of five years, the total number of term members on the Corporation being fifteen.

The Alumni Association has recently assisted in contributing money to the Institute. A few years ago it appointed a committee to raise funds for a building in memory of our beloved former President, General Francis A. Walker. The amount now on hand for this purpose is \$117,620.90. The building will be a social centre for students, containing social rooms, dining-rooms, student offices, baths, swimming-tank, and such other conveniences as may be found desirable; and it will be erected as soon as a new site for the Institute has been secured. The Technology Fund, which was contributed by alumni and which amounts to about two hundred and fifty thousand dollars, was presented to the School without conditions to be used for such purposes as the Corporation might designate. One-half the expense of the Tech Union was taken from this fund.

The official organ of the Alumni Association is the *Technology Review*, which is published quarterly, containing news from all the classes, condensed records of what the undergraduates are doing, and the principal items of news in regard to the Institute and the doings of the various activities connected with it.

Once a year, usually in January, the Alumni Association has a dinner in Boston, — the meeting in 1909 bringing together five or six hundred men.

In 1904, at the instigation of the Class of '93, and the Northwestern Association of the Institute at Chicago, an All-Technology Reunion was held for three days in Boston during the early part of June. This was so successful that it was decided to hold large reunions every five years. The second of these reunions was held in June, 1909, and the third will occur in June, 1914. These

gatherings have helped to increase the *esprit de corps* of the graduates of the Institute, who are now fully alive to all its interests and who are preparing to raise an immense sum of money to further the development of their Alma Mater and to house it properly on a new and desirable site in the city of Boston.

An alumni committee on student welfare has been appointed to coöperate actively with such undergraduate activities as may desire its advice and assistance. This committee is also empowered to examine into all matters relating to the welfare of the students and to make regular reports to the Alumni Association. It will thus be seen that Technology is now on a basis of full coöperation, and is in a position to accomplish much greater things than has ever been possible in the past.

MISCELLANEOUS INFORMATION

The Cage

THE "Cage" is the Institute name for the check-room and post-office, and is located on the second floor of the Union. Articles may be checked there free of charge, and all mail addressed in care of Technology, notices of meetings, and other notes are delivered through this post-office. Students should therefore call frequently for mail. Tobacco is sold, and copies of *The Tech*, *Technique*, and other publications can generally be obtained there.

Registration

As the Institute maintains a strict oversight of the work of its students it is necessary to have an elaborate system of registration. It is the purpose of the following description to help the new men, as much as is possible, to overcome the difficulties which confront them at the very beginning of their Institute career.

Before proceeding with the description of the method of registering, as applied to the special divisions, a few general directions will be given that are applicable to all new men.

Obviously, the first thing to do is to become informed of the date and time of registration. This information may be obtained from the Catalogue, or at the office in Rogers Building.

Knowing the time of registration, it is very advantageous to the student to put in an early appearance so

that he may at least be ready when the registration material is given out. As before stated, the system is complicated, and it takes the new men an appreciable amount of time to complete their registration. Then, too, an early appearance is advisable in order to become familiar with the surroundings before the regular work begins.

The registration material is ready and given out in Rogers Building several days before the opening of the term. All men should be sure to obtain and read the "General Bulletin." This Bulletin gives information about various subjects and tells what books to buy. It also contains useful general information.

We will next consider the Registration Material itself and explain how to fill it out.

(1) *The Tabular View*

This contains the hours of exercises of all subjects and is given out to all men, a separate one for each year. It also contains on the reverse side all the information that is necessary to enable the student to make out a complete program for the term, including rooms and instructors.

(2) *Address Card*

The Address Card contains on one side the weekly schedule blank, and on the other side spaces for the insertion of name, address, etc. It is kept on file in the Registrar's Office in order to enable persons to locate students during the day in case of emergency. It should therefore be carefully filled out with this object in view and corrected when a change is made. Each person registering should fill out two cards, one to hand in and one for reference.

(3) *Attendance Card*

The Attendance Card when filled out is a petition for subjects. During the first week of the term additions can be made by using a "Correction Card." After that the regular Petition Blanks should always be used for asking admission to subjects for which the student has not a clear record in *subjects required as preparation*. The required preparation for all subjects is indicated in the Catalogue and Programme.

(4) *Bursar's Card*

This card when filled out is kept on file for use in the Bursar's Department.

(5) *Military Science Card*

This card gives to the Department of Military Science the information required in the formation of the Cadet Battalion and for the Government Report called for by the Department of War.

(6) *Athletic Card*

This card when filled out gives the Alumni Council on Athletics information which it needs in planning for the athletic work for the year, for maintenance of the various teams and for the work of the coach.

(7) *Roll Slips*

These supplement the attendance cards and form a card catalogue of all subjects of instruction.

Students should pass in all the material, being sure that it is complete, and get a registration card in exchange. This card is stamped upon payment of tuition, and thus

stamped must be presented at the first exercise to insure admittance.

Information may be obtained from the Professors in the General Library in Rogers Building, and there should be no hesitation in asking help from the older men, for all are willing and glad to be of service.

There are two main classes of men who enter the Institute, and we will call the first one

Class A — Freshmen

Class A will in turn be divided into the three following groups:

- (1) Men taking the regular first-year studies.
- (2) Men admitted only to Special Work.
- (3) Men admitted with advanced standing, that is, with some subject or subjects passed off.

The second main division is

Class B — Men entering from other colleges

We will now consider the divisions of Class A, and tell what materials to ask for.

Class A (1). "Registration Material for First Year." Proceed to fill it out as directed above.

Class A (2). Same as for (1). However, if you are admitted to certain subjects they should be chosen from the Tabular View in consultation with the Dean or a member of the Committee of Advisors in the General Library on the days before the term opens.

Class A (3). If advanced work has been passed off (Trigonometry, Chemistry, History, Languages), Freshmen should consult some one in the Faculty as to the possibility of substituting for these subjects some second-year work.

Class B. College men should, at their very first opportunity, consult the Secretary of the Faculty in order to receive from him the "College Blank," on which excuse from subjects taken at another college may be recorded in consultation with members of the Faculty. The offices and consultation hours of these professors can be obtained at the Registrar's office. The year of the Course intended can be determined definitely after signatures for excuse from other subjects have been obtained. Except that men from other colleges fill out the attendance card for the professional course chosen, and have to plan their own program of work from the regular Tabular View, they register according to the instructions for the first-year students. For college men it will be useful in planning their schedule first to place on the back of an address card the hours of exercises of courses that have but *one section* and then *select* sections of the other subjects that are possible.

Student Banking System

FOR the benefit of students coming from a distance, a banking system has been established at the Bursar's Office. By this system a student, on depositing his check with the Bursar, is given a receipt, and, on presenting this receipt, he may at any time draw any part of his deposit he desires. This arrangement has proved to be very popular and convenient for out-of-town students who might otherwise have difficulty in cashing their checks. Last year \$50,000 was handled in this way.

Students' Boarding-House Bureau

AS an aid to new students a list of boarding-houses is kept at the office of the President's Assistant; and the list

of the Y. M. C. A. at its building nearly opposite Rogers is available for the use of students. These lists are made up with care, are reliable, and complete. They aim to furnish all the information about rooms and boarding that a new student needs to have.

Medical Adviser

THE Institute has appointed Dr. Franklin W. White, 416 Marlborough Street, a graduate of the Institute, as medical adviser for students. Lectures on personal hygiene are given by him to the students during the school year, and he may be consulted by students any Monday or Thursday afternoon between four and five o'clock in Room 13, Pierce, without payment of fee.

Bulletin and Advertising Boards

A Bulletin Board for the use of the various student activities is maintained in each of the principal buildings by the Institute Committee. These boards are divided into rectangular spaces.

In Rogers Corridor and in the Union are Advertising Boards divided into $4\frac{1}{2}$ -inch squares. These boards are to be used for "Lost," "Found," and "For Sale" notices, etc.

Two horizontal rows of squares on the Union Advertising Board have been reserved for the use of the Calendar Committee.

The following rules should be observed in posting notices on any of the Institute Committee boards. Notices not properly posted may be removed by the Bulletin Board Committee.

(1) All notices must be neat and must be securely fastened in the rectangles provided, without the use of

glue or paste. It is recommended that every notice be attached with at least four tacks.

(2) Notices announcing events of which dates are given are to be removed when the last date is past.

(3) All other notices, including all notices on the Advertising Boards, are to be dated on the day of posting.

(4) Notices dated at the time of posting will be removed after two weeks, unless a special request for extension appears on the notice.

(5) All boards are intended for the use of students, and outside notices and advertisements will be allowed only when the space is not needed for student purposes.

The Library

THE General Library in the Rogers Building contains a catalogue of all the books in the departmental libraries scattered throughout the Institute buildings. The books on the shelves in the General Library are principally those for consultation in connection with the courses in History and English Literature; dictionaries and encyclopedias; and foreign and American periodicals and magazines. Students taking books from the Library must leave a receipt for them with the Librarian or his assistants.

The Library is open from 9 A.M. until 10 P.M. on every week day except Saturday, when it is closed at 1 P.M. At all these times it is available to students of the Institute as a room for reading and studying.

Summer Schools

THERE are summer *courses* and summer *schools* at the Institute of Technology. The summer courses are given in Boston and are attended principally by students who

wish to anticipate some of their work or to make up deficiencies in their past work. These courses are also open to persons who are not students at the Institute of Technology who are properly qualified to pursue the work they wish to take. Many men from other colleges, intending to enter the Institute with advanced standing, take these courses. The schedule of these summer courses may be obtained at the Information Bureau.

The summer *schools*, which are entirely optional and are open only to students in the special departments, give a training additional to that of the regular curriculum. They are usually held at some point distant from Boston which offers exceptional opportunities for instruction in the special subject. For instance, the summer school in Topographic and Hydraulic Engineering will be held this year at Rangeley Lakes, Maine. The summer school in Mining Engineering has been held in the past in Colorado, and in Nova Scotia. Also travelling summer schools have been organized for architectural students, for chemical students, and for students of metallurgy.

Scholarships

A CERTAIN amount of funds is available for scholarship grants. These grants, however, are not made until at least one term, and, as a rule, one year has been spent at the Institute. A clear record and promise of continued high scholarship are requisite on the part of the applicant. Forty state scholarships are annually granted by the State of Massachusetts to students who have prepared in the public schools of the Commonwealth. Full and detailed information in regard to all the scholarships which have been established can be found in the Catalogue or by con-

sultation with the Chairman of the Scholarship Committee. Students who are in need should not hesitate to consult the Chairman or the Dean.

Employment Bureau

THE student who contemplates earning all or part of the money necessary to defray his expenses while at the Institute should bear in mind the fact that the larger part of the time which is spent outside the classroom must be devoted to study and the preparation of his lessons. It is, therefore, inadvisable for him to count on a very large amount of income from this source during the school year. Moreover, people wishing occasional odd tasks done are not willing to pay very much for them, and are apt to be exacting about the accomplishment of the task at an inconvenient time.

There is, however, quite an opportunity for the energetic student to earn small sums of money from time to time and, in some cases, to acquire valuable experience. To assist such men, the Institute maintains an Employment Bureau, the aim of which is to help needy students so far as it may, and to supply such business firms and residents of Boston as may need it, with help on special occasions. The work done by the students ranges from acting as shipping clerk and waiting on table to attending invalids and driving automobiles. During the school year 1908-09 about forty men were placed in various positions by the Bureau.

The matter of employment during the summer vacation is rather different. In this case a majority of the students find positions for themselves. The Bureau, however, has been successful in placing men in positions which would furnish valuable experience or a good net income for the summer, and, in many cases, both.

A good many applications for men to do canvassing in the summer are sent to the Institute, and these are put before all those whom they might interest. All positions of other nature are, however, treated as special cases, the best man, as in the term time, being recommended for the place.

Freshman Drill

THE Institute was organized just at the close of the Civil War, a time when the feeling that men should have some knowledge of military science was strong. It was at this time also that the United States Congress made grants of land to each state for the support of one or more schools giving instruction in agriculture and the mechanic arts. It was therefore quite natural that instruction in military science should be made a condition of these appropriations. Besides requiring this instruction in military science, Congress subsequently provided that, if desired by the college, the President of the United States was to detail as instructor an army officer of not less than five years' experience in the regular army. The Institute accepted from the State an offer of one-third of this appropriation, and consequently established the Course in Military Science which is required of all Freshmen, except aliens and men over twenty-one years of age.

The Course in Military Science consists each week of a one-hour lecture and two hours of drill in the afternoon in the Armory. Blue uniforms, white collars, white cotton gloves, and black shoes are required. The uniforms are usually obtained at second-hand. The guns are supplied by the government. The M. I. T. Corps of Cadets is a battalion divided into four companies, and a band composed of students. This battalion constitutes the Third Massachusetts Reserves.

At the beginning of the year an examination is held so that those who have drilled at a preparatory school may have a chance to become non-commissioned officers. At the end of the year two officers are recommended to be appointed Second Lieutenants in the regular army. The last, or the next to the last drill is a prize drill between the companies, after which white gloves and collars are burned on Rogers steps. The company that wins is given a dinner. On Saturday afternoons in good weather, those who wish may go to the State rifle range at Wakefield, where rifle practice is held. The guns for this practice are obtained at the Armory by a written order from the instructor. The State furnishes the ammunition. The carfare for the round trip is thirty-two cents.

In the war with Spain Tech men played a large part. There is a record of ninety-six men, both graduates and undergraduates, who enlisted. Of these, all but eight started as officers, and promotions followed rapidly. Thus Freshman drill helped those who enlisted for the Spanish-American War.

Physical Training

PHYSICAL training is now compulsory for Freshmen.

During the first month of the school year appointments are made for each man in the class to meet the gymnasium instructor, who provides for tests and physical measurements, from which an individual anthropometric chart is plotted. This chart shows the physical condition and strength of each man as compared with one of the same height and weight when in normal condition.

Those passing successfully the physical examination are allowed to substitute, if they wish to do so, regular track athletics for gymnasium work. The remainder of the class is divided into sections for gymnastic exercise of two

hours a week on two different afternoons. The gymnasium classes commence work immediately after Field Day and the classes are continued until the end of April.

At the close of gymnasium work in the spring each student is examined a second time and the results of the measurements are plotted on the same chart that was given him at the beginning of the school year. A comparison of these two sets of measurements shows the improvement made during the year. A committee of the Faculty awards each year five large bronze medals, called the "Cabot Medals," to the five men showing the greatest improvement in physical condition made during the year.

A Course of four lectures in physical hygiene is given to the Freshman class during the month of October.

A man may be excused from gymnasium work on petition to the Faculty if he is physically disabled, if he is over twenty-one years of age, or if he lives at such a distance from Boston that it is seriously inconvenient for him to attend exercises after 4.00 P.M. Petitions for excuse from gymnasium must be submitted to the Dean at the beginning of the school year.

The Point System

THE "Point System" is an institution which aims to prevent a student from carrying too much outside work to the detriment of his studies. Every office and activity is assigned a definite number of points, and no man may carry more than a total of ten points, except in the case of track athletics. With track athletics a man may carry one other office, even though the two total more than ten points.

The system was put into operation by the Institute Committee in the fall of 1908, and is enforced by one of

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its standing committees. The rating of offices in its most recent form (March, 1909) is given below.

Class A — 10 Points — Editor-in-Chief of *Tech* and *Technique*, General Manager of Tech Show, President of Senior Class.

Class B — 9 Points — Managing Editor of the *Tech*, Business Manager of the *Tech*, Chairman of Union Dining Room Committee, Business Manager of *Technique*, Business Manager of Tech Show, Stage Manager of Tech Show, President of the Junior Class, Manager of the Track Team, Executive Committee of the Institute Committee.

Class C — 8 Points — Editors of *The Tech*, Assistant Business Manager of *The Tech*, Members of Technique Board, Advertising Manager of the Tech Show (during second term).

Class D — 7 Points — Chairman of Union House Committee, President of Y. M. C. A., President of Sophomore Class, Members of Junior Prom Committee, Members of Senior Portfolio Committee, Assistant Business Manager of Tech Show.

Class E — 6 Points — Chairman of Entertainment Committee, Manager of Fencing Team, Captain of Track Team, Associate Editors of *The Tech*, Assistant Advertising Managers of the Tech Show, Principals of Tech Show, Manager of the Basket-Ball Team, Manager of the Hockey Team, Leaders of Musical Clubs, President of the M. I. T. A. A., President of Professional Societies, President of Freshman Class, General Manager of Musical Clubs, Institute Committee.

Class F — 5 Points — Candidates for Assistant Track Manager, Chorus of Tech Show, Technique Electoral Committee, Candidates for Track, Cross-Country, Hockey, Fencing and Basket-Ball Teams, Members of Musical

Clubs, Members of and Candidates for News Staff of *Tech*.

Class G — 4 Points — Business Staff of *The Tech*, Managers of Class Teams, Assistant Managers of Basket-Ball, Hockey and Fencing Teams, Managers of Musical Clubs, Architectural Record, Assistant General Manager of Musical Clubs, Members of the Union Committee, Members of Sub-Committees of Union Committee, Advertising Manager of Tech Show (first term).

Class H — 3 Points — Members of and Candidates for Class Teams, Treasurers of Classes, Secretary-Treasurer of M. I. T. A. A., Undergraduate Members of the Advisory Council, Gymnasium Team, Manager of Tennis Team.

Class I — 2 Points — Secretaries of Classes, Members of M. I. T. A. A., Secretaries and Treasurers of Professional Societies, Secretary-Treasurer of Y. M. C. A., Manager of the Golf Team, Members of and Candidates for Golf and Tennis Teams.

Class J — 1 Point — Vice-Presidents of all organizations, Standing Committees of Professional Societies, Standing Committees of Y. M. C. A., Officers of the Coöperative Society, President and Secretary of the Musical Clubs, Executive Committees and Directors of Classes, Officers of all other Clubs of open membership.

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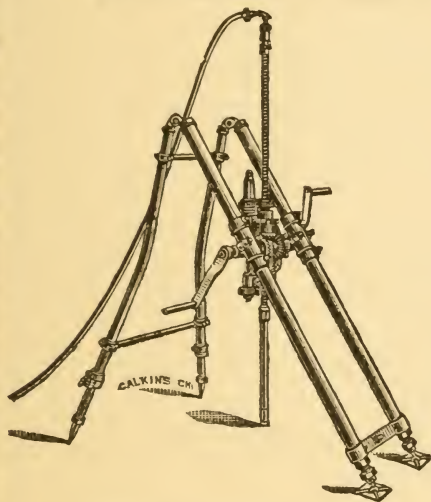
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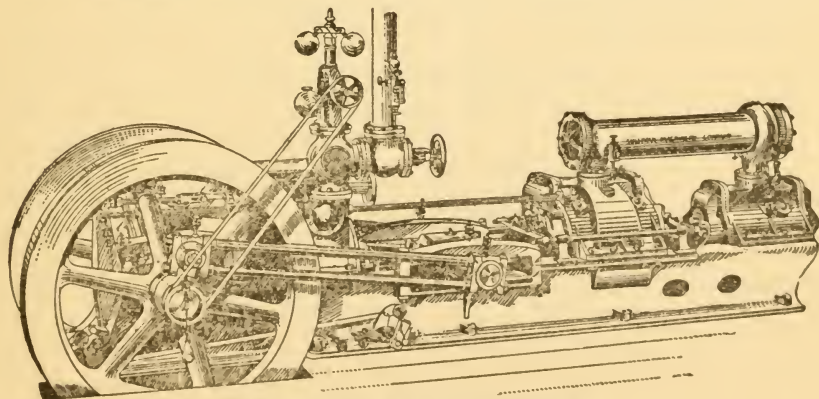


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